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AND

PATTERN-MAKER.

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THE PATTERN-MAKER.

By W. P.

PERHAPS in no trade connected with engineering are the qualities or abilities of men shown to such a marked degree as in that of pattern-making, and it is really surprising what a difference there is between one man and another, both in the quality and in the quantity of work turned out. Also as regards the differences in opinion as to the best method of making the patterns, either in putting together for cheapness or durability, or in the convenience for moulding purposes. This is not to be wondered at considering the nature and variety of work required.

There is no doubt that to be a good pattern-maker it is necessary to have a good general knowledge of the other trades connected with engineering, and in addition to this a man must be able to read a drawing as well as a draughtsman.

Taking all this into consideration, the question might be asked: What constitutes a good pattern-maker? One man may be able to read a drawing as if it were a book, and then make a pattern that will not leave the sand. Another will make and finish a job to such an extent that it almost seems a pity to spoil it by putting it into the dirty, damp sand. Then there is another who will rush and tear away at the job until finished, and then, through some oversight, finds he has to do half of it over again. It is needless to say that none of these can be called good pattern-makers, but anyone who tries to convince them otherwise will take a big job on.

The aforementioned does not by any means represent all the types of men. I have known those who have been splendid workmen so far as finish, working to sizes, and altogether making a pattern that was ideal from a moulder's point of view, but ruinous to the one who had to pay for it. The worst feature generally about this type is that every job is treated alike, no matter if there is only one casting required, or it may

be for a breakdown and wanted in a hurry; he has only one style of finish, which is the best, and one speed, which is terribly slow. Others could not put a good finish on a job however much time they had, but were otherwise good men in the shop, knew when to leave a piece loose, where best to put a core, the strongest way to put the pattern together to stand rough usage, all to correct sizes, able to draw easy from the sand, and all done in a reasonable time.

Another type, not by any means rare, is the one who has no confidence in himself, always seeking advice, either taking up the time of his neighbour or bothering the foreman. Otherwise he may or may not be a good workman, but there is no doubt about him being a bit of a nuisance.

Although they are not all perfect, there is room for most of them, especially in those shops where there is a variety of work done; in fact, it may be an advantage to have a few of each kind in such a shop, and I venture to say that it is just here where a foreman can show to some extent good or bad judgment in the choosing of his men, and in apportioning the work that is most suitable for each type of workman; for not only is it uneconomic, but it is also bad policy to put a good man on, say, repairing patterns, or doing bits of odd jobs, when a poorer workman could do them just as well, for, in many instances, the good one will very likely jib at the work, and knowing that he is capable of something better he fails to give his mind to the work, and the output suffers in consequence.

The ideal workman is the one who can read drawings, knows how, and does make a good job when required; or, on the other hand, how to make or rig up any sort of pattern that may be wanted in a hurry, cheap and quick, practically anything so long as it is to size and will draw out of the sand, and generally be able to adapt himself to the various circumstances that arise.

FIG. 1.—MAIN BUILDING, SOUTH FRONT, NATIONAL PHYSICAL LABORATORY AT BUSHY HOUSE, TEDDINGTON.

Referring to adaptability, it is surprising to see how it is just as easy for some as it is hard for others to rise to the occasion. This is very often noticed in a man starting at a fresh shop, for foremen have their own peculiarities as well as the men, and although in many instances other influences help to determine the different methods adopted, the sooner the newcomer assimilates these methods, or practices, the better it will be for him.

Before concluding, and to show where

this comes in, I will just relate a little incident which actually occurred in a shop in Glasgow, and where I was employed at the time; a newcomer, who had been started three or four days previously, had occasion to make a pulley boss about 6 in. diameter and 4 in. thick; there was only one casting required, but the man had evidently come from a shop where much standard work was done, and cost a secondary consideration, for he commenced building this up in quarter circle segments about 1 in. thick; he had got the third lot nicely glued and sprigged, when the foreman got his eye on it; then there was a bit of fun "to the spectators"; he ripped out at the man, threw the job to the other end of the shop, and asked him if he had anything in his thick head at all. The man was rather surprised, but managed to keep cool, and replied, "No, have you?" and commenced to pack up his tools.

After all that may be said about him, the pattern-maker has a lot to contend with, and he would be a good one indeed if he was able to please all; in fancy, I hear a chorus of moulders saying, "Aye; but there are more bad ones than good ones," and to these I would say be charitable, for he does his best. A few months ago a prominent gentleman connected with a railway was making a few remarks about accidents on railways, in the course of which he made the peculiar statement that if the passengers only knew of the accidents that didn't happen there would be a great deal less travelling than there is. Now, you moulders, when you get hold of a pattern which you think is not quite correct, don't go growling about at the pattern-maker, but just try and get a little consolation from the thought that it might easily have been worse.

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THE NATIONAL PHYSICAL LABORATORY.

The work of the National Physical Laboratory may be classified under two heads:—(1) Original research and investigation. (2) Standardisation and testing of instruments and materials. The first head may be sub-divided into researches undertaken at the initiative of the committee and paid for out of the Government grant or funds specially given for the purpose, and researches undertaken at the request and expense of firms and individuals.

Fig 2.—New Buildings, National Physical Laboratory.

For many years before the foundation of the laboratory, important work on standardisation had been carried out at the Kew Observatory in the Old Deer Park, at Richmond, and it was originally intended that the new laboratory should be placed in the Deer Park, commencing as an extension of the observatory. This plan was altered and a home found for the new institution at Bushy House, Teddington.

New buildings have been erected for engineering and electricity, and others are in progress of erection, but the greater part of the physical work of the laboratory is carried out in Bushy

House itself. The house is in some respects admirably adapted for a laboratory of this kind. It consists of a central block some 70 ft. square, containing a basement and three stories. The basement rooms are good and fairly well lighted; they are suited for experiments requiring steadiness and an equable temperature; the ground floor rests on brick vaulting, so that firm supports can always be obtained for instruments, and the rooms on this floor make excellent laboratories.

At each angle of the main block there is an isolated wing—our illustration, Fig. 1, shows two of these—containing fair-sized rooms on the ground floor. Each wing is devoted to a different department of the work; thus it is possible to keep the various branches distinct, and at the same time retain them under one central control. The arrangement is not unlike Sir Oliver Lodge's ideal laboratory—a central block to serve as museum, entrance hall, offices, etc., and four wings assigned to different branches of the work. No doubt the arrangements might be greatly improved in a new building erected specially for the purpose, but few old houses would serve for a laboratory so well as Bushy House.

At the time of the establishment of the laboratory a sum of £19,000 was voted by Parliament for fitting up the old house and for erecting certain new buildings and equipping them with some necessary machinery. Last year Parliament voted £5,000 for buildings, and the committee received an anonymous donation of £2,000. These funds have been devoted to the electrical buildings; while during the present session a grant of £10,000 for buildings has been placed on the estimates.

The new buildings consist of :—(1) The engine and dynamo room and boiler house; (2) the engineering laboratory; (3) the electrical and photometric laboratory; (4) the lathe house for the special screw-cutting lathe of the War Office.

(1) *The Engine and Dynamo Room.*—This contains at present a 75-kw. Parsons turbine giving 110 volts at about 3,600 revolutions, supplying the laboratory with light and power. As a standby there is a small Parker dynamo driven by a gas engine, but a 50-kw. motor-generator set, by Messrs. Mather & Platt, driven from the mains of the Twickenham and Teddington Electric Supply Company, is being installed. There is also a booster set for battery charging by Thomas Parker & Company, and a second booster for the same purpose by Mather & Platt is now on order. The turbine is driven from one of a pair of 100 h.p. Lancashire boilers in the adjacent boiler house, while the same boilers serve for the heating of the laboratory, which is done by low-pressure steam. The pumps working the steam system are in the engine room.

(2) *The Engineering Laboratory* is a top-lighted shed in two bays, each 80 ft. by 25 ft. and 15 ft. to the eaves, with a drawing office, stores, etc., attached. Plans have been prepared for doubling the present accommodation of this part of the laboratory, and the work is now in hand. As at present arranged one of the two bays is occupied by the machine tools required for the work; the other is employed for the engineering researches and tests. The tools include six lathes of various capacities, a milling machine, a grinding machine, a shaping machine, and some drilling machines. Work of a high order of accuracy is required for much of the apparatus, while the preparation of materials for researches and tests in the engineering and metallurgical departments occupies a large portion of the time of the staff.

(3) *The Electrical Laboratory.*—This building is planned for electro-technical experiments, including in these photometric work.

(4) *The Lathe House.*—This consists of a single isolated building 40 ft. by 70 ft., like the others top-lighted from the north; within this is a room 35 ft. by 15 ft. roofed with glass, planned so as to be maintained at a uniform temperature. The room contains a lathe designed by a committee of the War Office for the purpose of adjusting and measuring the leading screws of lathes, with a view to securing uniformity of pitch and interchangeability in parts of guns and other work for the department. The lathe was constructed by Messrs. Armstrong, Whitworth & Company, and the error in pitch of screws adjusted by its aid does not amount to more than one or two tenthousandths of an inch in a length of 3 ft.

Thermometry.—This branch, under Dr. Harker and Mr. Hugo, deals with (*a*) accurate standards of thermometry; (*b*) methods of producing and measuring high and low temperatures, *e.g.*, from 200 degrees C. to 2,000 degrees C. or below 0 degrees C.; (*c*) the standardisa-

tion and calibration of instruments for the measurement of temperatures over these ranges

Metallography.—A number of important researches have been carried out in this department; the last was on nickel steel, and laterly an investigation into the properties of aluminium bronze was conducted by Dr. Carpenter. The department is fitted with the appliances necessary for the work. Among these may be noted a Zeiss photomicrographic outfit, apparatus for taking cooling curves, and a number of muffles and ovens.

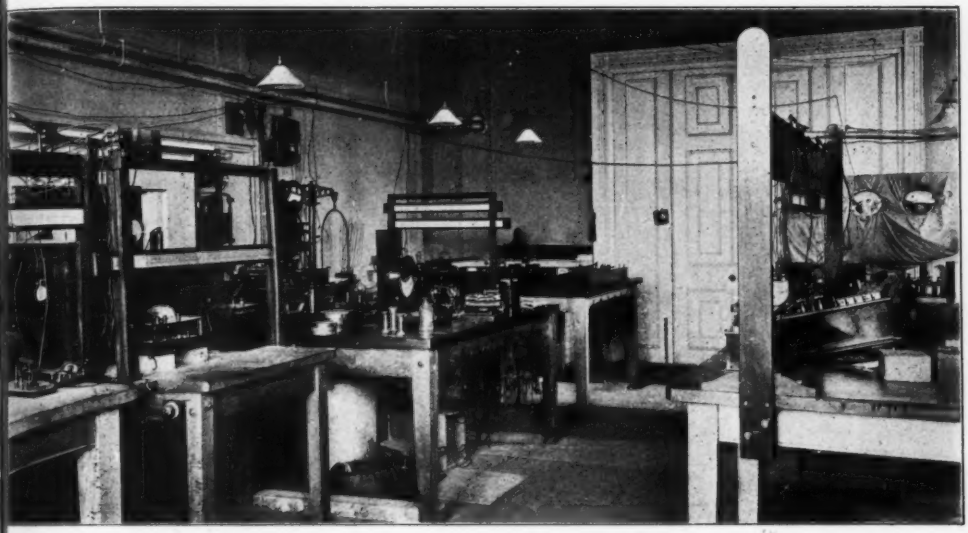

FIG. 3.—ELECTRICAL STANDARDS ROOM, NATIONAL PHYSICAL LABORATORY.

Engineering Laboratory.

This division is under the superintendence of Dr. Stanton, who is helped by Mr. Jakeman and Mr. Bairstow. The researches at present in progress include :—(*a*) An investigation into the measurement of wind pressure; (*b*) an examination into the effect of rapid alternations of direct stress on certain materials of construction; (*c*) methods of impact testing; (*d*) the specific heat of superheated steam; apparatus is installed for this work. In addition, apparatus is installed for the testing of pressure gauges, for measuring the efficiency of materials used for lagging steam pipes, etc., for photomicrographic work, for testing indicator springs, and various other experiments. There is also a small 10-ton testing machine, and a specially devised 1-ton testing machine for alternate tension and compression.

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THE "EMPIRE" CRUCIBLE TILTING GAS FURNACE.

ALLDAYS' "Empire" crucible gas furnace, which is illustrated in Figs. 1 and 2 herewith, has been specially designed for melting brass, copper, aluminium, iron for malleable castings, etc. It possesses some advantages over the stationary type of furnace, where the crucible has to be lifted out with tongs, the greatest of which is the much longer life of the crucible owing to the fact that it is not removed when pouring but remains in the hot furnace, and is protected from coming into direct contact with the cold air; thus the sudden contraction which is so destructive to the crucible is entirely avoided. The average length of life of the crucible is about 28 to 45 heats in this furnace, whereas with an ordinary pot fire, such as is used in brass foundries, the life varies from 4 to 10 heats.

By means of Alldays' hot air blast apparatus the air is heated to a high degree before it enters the furnace. The air from the blower is conducted to a receiver which surrounds the chimney pipe, and after entering it near the top leaves it near the bottom, by which time it has practically attained the temperature of the gases in the chimney. The hot blast chamber, which is shown in the illustrations, can be fitted to the furnaces, and will result in an increase in the temperature of about 450 degrees, the usual temperature for working the blast being about 2,650 degrees Fahr. This heating of the air is a source of economy, and assists in bringing the metal down quickly with the minimum amount of fuel. The furnace is lined with fire-brick, and the burners project the flames against the concave lining, causing them to take a spiral course around the crucible, thus avoiding any cutting action against the crucible side.

The makers claim the following advantages over others. The proper proportion of air and gas for complete combustion is controlled by each burner, they being adjustable both for the air and gas at the nozzle; hence when the volume of air or gas is adjusted, no alteration of pressure takes place as is the case when the adjustment is done by means of cocks on the main pipes leading to the furnace; therefore these burners claim to be more economical than any other, and no explosion can take place when lighting up.

The makers are Messrs. Alldays & Onions Pneumatic Engineering Company, Limited, Great Western Works, Birmingham.

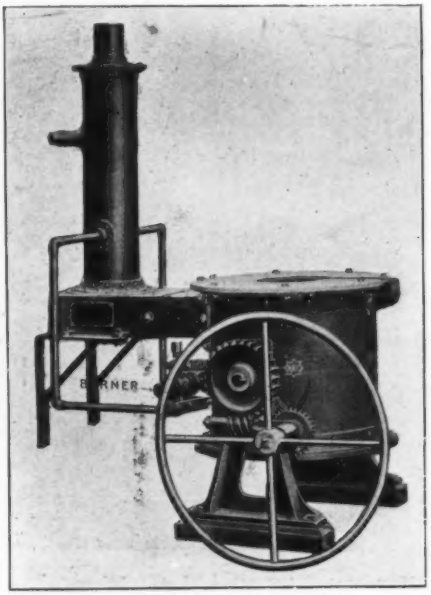

FIG. 1.—NORMAL POSITION.

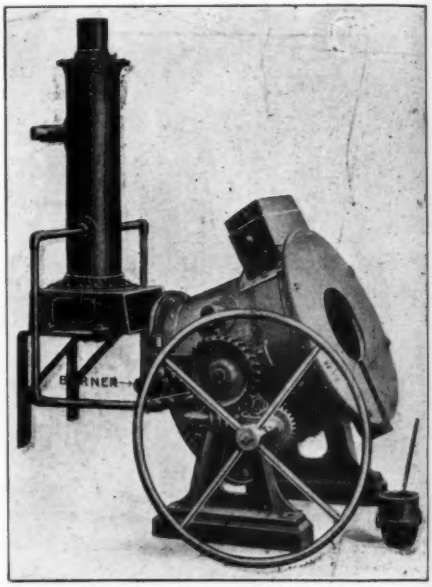

FIG. 2.—TILTED FOR POURING.

THE "EMPIRE" CRUCIBLE TILTING GAS FURNACE; FROM PHOTO OF 120 LB. SIZE FOR USING TOWN GAS.

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MESSRS. J. & C. HOLCROFT, of the Portfield Iron and Galvanising Works, Tipton, have decided to close the galvanising portion of their works.

MESSRS. HARRISON & COMPANY, 173, High Street East, Sunderland, agents for Cameron's piston springs and Mollerup's lubricators, have taken up the North of England agency for the "Valoric" steam-feed heater, and Bird's tube expanders.

GOOD MOULDERS — WHY ARE THEY SCARCE ? *

W. S. McQuillin.

Among the many problems with which foundrymen of the present day are confronted, is one which appears to demand the closest attention. This problem is the future supply of competent moulders.

It must be plain to all that there is, under prevailing conditions, much waste of material, time, and labour, a better knowledge of which on the part of those by whom they are handled could effect considerable savings.

Nearly 3,000 years have passed since the time when Hiram was called to Jerusalem from Tyre to make the great vessels, columns, and certain other parts for the famous temple of King Solomon, descriptions of which lead us to the conviction that they were among the greatest achievements of the moulders' art, and that Hiram and those employed with him upon the work were mechanics whose skill and knowledge were of a high order.

As our minds turn back over the past and we consider what has been done, it seems only fair to expect that the skill of moulders would have kept pace with the many changes and improvements which advancing civilisation has brought about; and that the art would be practiced by them upon a much higher plane than it is to-day. It is the universal opinion among foundrymen that good moulders are scarce, and that they are growing scarcer year by year, and we hear much complaint that the craft in general is not up to the high standard of competence which should mark the present times. Those who are brought daily in contact with moulders could give many instances that would go to show the lack of skill and ability in the average moulder. Especially is this true in the jobbing shops, where the endless variety in structure and design of the goods they are called upon to produce calls for "all-round" workmen whose intelligence and judgment should enable them to successfully cope with the many difficulties encountered in the making of castings. The average moulder seems to possess very little knowledge of these things, and is almost totally ignorant of the laws governing "cause and effect." We still find him working along with the same old "cut and dry" methods, using his mind to little purpose, and trusting always to "luck" more than to good management and an exercise of judgment, to produce results.

How often we marvel at the reasons advanced by moulders to account for their failure to obtain satisfactory results. If a small part of the ingenuity displayed in forming excuses was employed to invent ways and means of preventing losses or poor work, the average of "good luck" would be higher than it generally is, or if their excuses were always thought out before a job was commenced they would seldom be required to offer them when it is completed.

Are there reasons connected with the business that the foundry attracts only human material that is not fitted for other vocations, where the exercise of brains and a certain standard of pride in work is required? Are there so many more inviting positions open to young men of ambition and intelligence that the foundry can secure none but those whose only qualifications seem to be ability to stand hard work under the many disagreeable conditions to be experienced in the dirt and smoke incident to foundry procedure? This, while on all other sides appear the evidence of light, clean and pleasant employment, with opportunities of advancement, or at least an occupation at which they will be able to earn a living in their older years.

Is there nothing to show that this industry is one that demands abundant talent, and that in spite of the features that appear disagreeable, its followers have many opportunities of advancing far above the level of common labour. Does the appearance of the conditions mentioned keep away the good stock of which mechanics are made, or does the actual existence of these conditions in the foundry blunt and destroy all desire for knowledge and advancement with which the average human being is endowed?

Is the modern foundry practice of specialising, and the introduction of the moulding machine, a cause of the wanting competence of the moulder as a mechanic? Does the practice along these lines keep a man down to the level of the common labourer?

It seems proper that we should here ask, to what extent foundrymen themselves are responsible for the scarcity of

* Abstract of Paper read before the American Foundrymen's Association.

good moulders? Are the conditions imposed upon men working at the trade such that they have no chance to develop their minds as well as their muscles, both of which are so important to the production of a paying quantity of good castings?

It is to be feared that there are many foundries in which the facilities and equipment is by no means up to date, and still moulders are expected to produce castings in competition with others in which modern improvements and up-to-date methods have been acquired.

shadowed that of the moulder. It is true we often read the details of the moulding and casting of some important piece of work. A great deal is told of how the different parts are made and handled, but, as a rule, we are shown only the physical operations of the work, while we are often left to guess the reason why certain methods are employed. Indeed, frequently less notice is given the moulder who does the work than is paid to the ladle or crane by which it is poured.

Regarding competition: The foundry

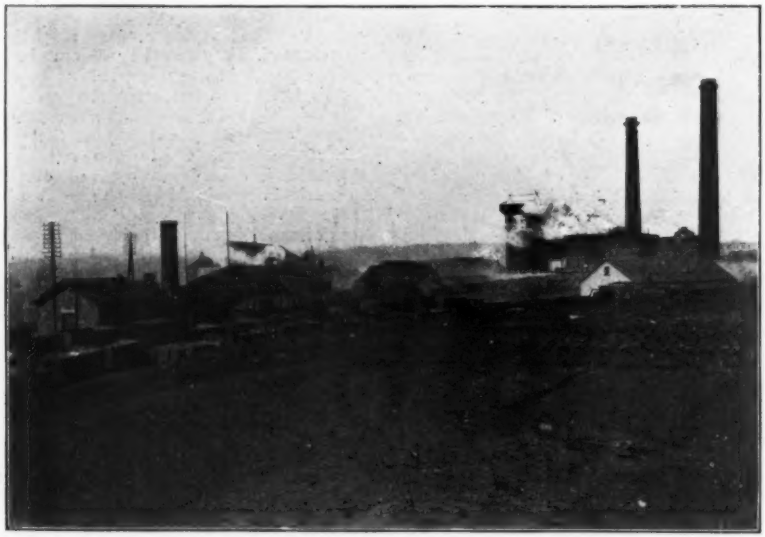

FIG. 1.—GENERAL VIEW OF THE IRON WORKS AND FOUNDRIES.
NORTHAMPTONSHIRE DIRECT CASTINGS COMPANY, LIMITED.

What premium is usually paid talent and intelligence when it is met with in the foundry? Is it always appreciated and encouraged? Are the bright and faithful men and boys always given opportunity to exercise the talents they may possess?

Much has been written and told relating to irons, fuels, cupola practice, and cost keeping and to show by a more or less thorough analysis of these subjects how and when the best results may be obtained.

So well have these matters been discussed that in many foundries the importance of the melter has far over-

is fast undergoing a revolution in which many methods of a few years ago are being abandoned, and much of the work that has been done by bodily labour more or less strenuous, is now being taken care of by machinery. In the future the up-to-date foundry will not experience so much trouble from the scarcity of good moulders, as the most intelligent will be attracted to them. They will there find many opportunities for using their brains, while steam, air and electricity will do the rest. The foundries that have not kept pace with the times will get only those of little use to anybody and will be obliged to work

them harder to make a showing in the competition with their more advanced and up-to-date rivals.

Man is by nature a thinking animal, and those who possess considerable intellect are not looking for jobs in which ability to perform physical labour is the principal requirement.

Recognising these facts, it must be plain that the successful foundries of the future will be those in which the greatest amount of hard labour and disagreeable conditions have been eliminated.

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THE late Mr. H. P. Chappell, senior partner of Messrs. Bailey, Pegg & Company, engineers, of Brierley Hill, left estate valued at £11,063.

CONSEQUENT on the decision of the directors of Palmer's Shipbuilding and Iron Company, Limited, to adopt the Talbot process, an entire reconstruction of the melting shop is in progress, and other extensive improvements are also being made.

DIRECT CASTING AT WELLINGBOROUGH.

CASTING direct from the blast furnace is, of course, not a new development in metallurgy; but the practice has not been much followed, except for rough castings for works purposes or for very cheap shapes of cast iron goods. As the efforts made in the latter direction have not in all cases been successful, the means adopted at Messrs. Butlin's works are of considerable interest. The success has been attained, not so much by mechanical means as by a careful study of the chemistry of the subject by Mr. W. H. Butlin, the able managing director of the firm.

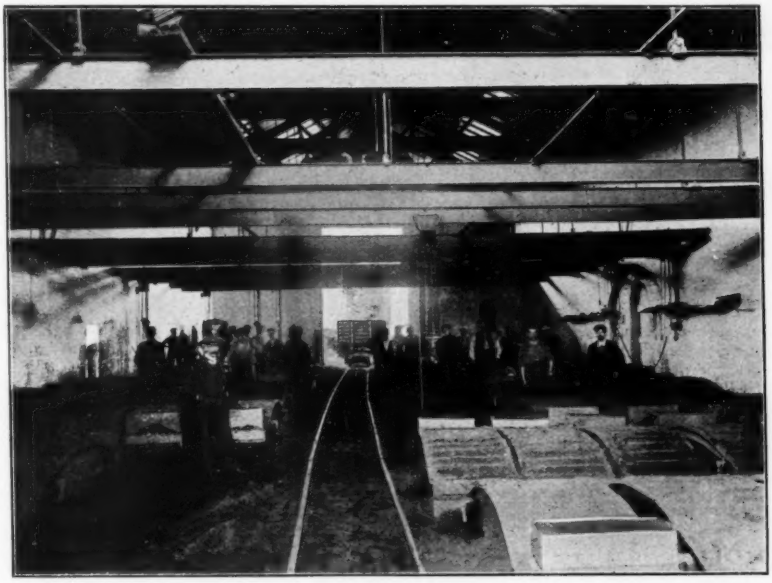


FIG. 2.—FOUNDRY MOULDING SHOP.

NORTHAMPTONSHIRE DIRECT CASTINGS COMPANY, LIMITED.

The Northamptonshire ore may be described chemically as a brown hematite from the inferior oolite formation; it is a hydrated sesqui-oxide of iron containing about 6 to 7 per cent. of water of combination, in addition to the ordinary moisture found in it. The yield of the raw ore averages in bulk from 34 to 37

per cent., but a certain proportion of calcined ore is used to augment the yield.

As good iron is accompanied with good slag, the quality of the slag was regarded during the experiments as an index to the character of the iron. What was aimed at as typical was to get a slag which contained about 15 per cent. of alumina, 32 to 33 per cent. of silica, and 40 to 43 per cent. of lime. The result was a combination fusible at a comparatively low temperature. The blast used is preferably at about 900 degrees Fahr. Special care is taken in the selection of the limestone to ensure as far as possible that it will be porous, and that it will thus flux more readily, and facilitate the admittance of graphitic carbon into the iron. Another important element in success has reference to the quality and purity of the coke used. The care taken in connection with limestone and coke obviates a higher temperature in the blast furnace than would otherwise be necessary, and gives a sound and solid casting.

The fuel consumption—about two-thirds coke and one-third hard Yorkshire coal—is at the rate of 22½ cwts. per ton and the make—principally foundry iron—has the following constituents :—

Graphitic carbon	2.85
Silicon	1.92
Sulphur	0.10
Manganese	0.24
Phosphorus	1.19

Owing to the circumstance that the district is deficient in hard rocks suitable for road making, the iron works are in the position of being able to dispense with a slag tip. The cinder as it runs from the furnace is moulded into rectangular blocks of about 13 cwts. in side-tipping cast iron bogies, which chill rapidly. The blocks, when subsequently cooled, are roughly broken by hand and passed through a Blake rock breaker, with drum sizing sieves, which reduces the bulk up to road metal or railway ballast size, the finer chippings finding a use as ballast in making granolithic slabs, and a considerable quantity has also been used in decorative moulded work of the North British Hotel at the Waverley Station, in Edinburgh.

There are two blast furnaces working

FIG. 3.—TUNNEL SEGMENT MACHINE SHOP.

NORTHAMPTONSHIRE DIRECT CASTINGS COMPANY, LIMITED.

on this system at the Irthlingborough Iron Works, their combined capacity being about 700 tons per week.

The equipment of the foundry, though simple, is, nevertheless, efficient. The casting channels have been extended beyond the pig beds of the furnaces to the side of a sunk pit containing the receiving ladles, which vary in capacity from 3½ to 5 tons, and are taken away by a locomotive crane running on rails to the segment foundry, a view of which is shown in Fig. 2. This is a rectangular building of 100 ft. by 45 ft. open at the ends, with a railway running down the middle separating the floor space for the moulds. The ladles are manipulated by means of differential pulley-block buckles mounted on bogies, running on overhead joists. The castings are made in the foundry with ordinary sand. The specified test for the metal is a load of 28 cwts. on a bar 3 ft. 6 in. long by 2 in. by 1 in., set 3 ft. between centres. The foundry has turned out a large tonnage of tunnel segments since it was started. The segments weigh about 5 cwts., being 6 ft. 7 in. long, 20 in. wide, with plate ⅜ in. thick, and flange 1⅛ in. thick, and are formed with 4¾ in. flanges on all four sides, so that they can be bolted together to make a complete ring 11 ft. in diameter. The flanges, in accordance with the general practice, are on the inside, forming ribs to resist exterior compression. The ends of each segment are milled so as to ensure a good bedding and to make the circle absolutely true. This milling work (see Fig. 3) is done on special tools made by Messrs. Kendall, having beds curved to the shape of the finished ring upon which the segment is secured by bars passed through the end bolt holes, and both flanges are milled simultaneously. Whitworth steel is used for the cutters, and the segments, which are 20 in. wide, are milled in about seven minutes, excluding the time taken for fixing. The finished segments are removed from the planing machines by the crane and deposited on a pair of rail bearers beneath which is a coal fire which heats them up to the temperature required for receiving the protecting bituminous coating.

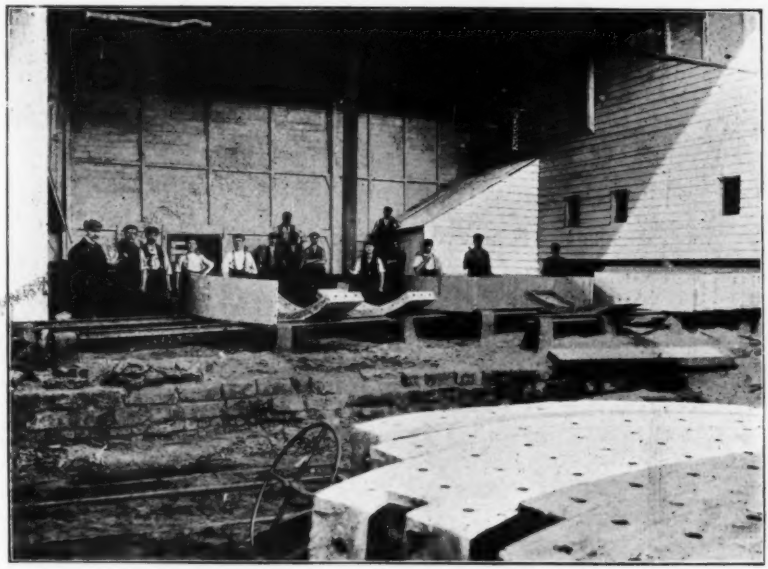


FIG. 4.—FETTLING SHOP.

NORTHAMPTONSHIRE DIRECT CASTINGS COMPANY, LIMITED.

The firm of Thos. Butlin & Company, Limited, was established in 1852, and was the first to smelt Northamptonshire

ore. The Northampton district is the most southerly iron-making district, and being only some 60 miles from London, the ironmasters of this locality have long looked upon the Metropolis as a most desirable market.

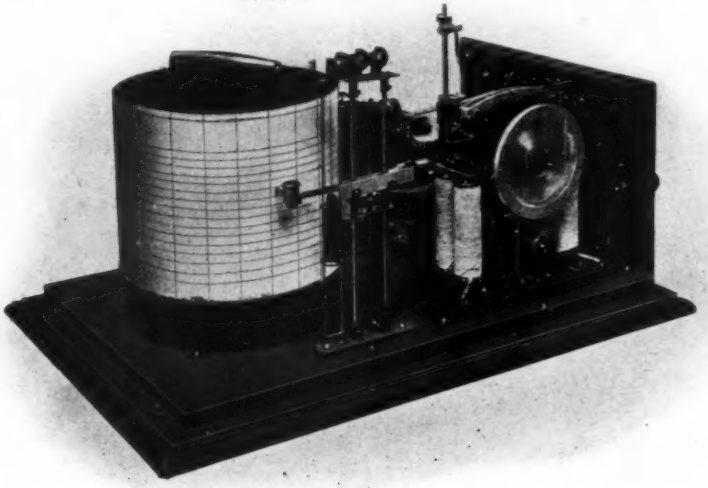
As, however, until recently, the output has consisted mainly of pig-iron, their aspirations as regards London were not capable of realisation, and, in fact, South Staffordshire was practically the only outlet for their material, in which district it was mainly used in the manufacture of wrought iron, although some portion of the pig output was distributed to the foundries and forges of the Midlands, where it was re-melted and worked into manufactured articles. The steadily increasing use of soft basic steel, which can be produced at a lower cost per ton than Staffordshire wrought iron, has, however, diminished the use and consumption of Northamptonshire pig-iron, and Messrs. Butlin some three years ago formed the Northamptonshire Direct Castings Company as a subsidiary branch of their firm.

MR. T. VICKERS, of Sheffield, has entered the service of John Yates & Company, Limited, of Aston Manor, Birmingham.

NEW AUTOMATIC RECORDER FOR HIGH TEMPERATURES.

IN the annexed illustration is shown a new recorder for high temperatures, which has been brought out by Messrs. Baird & Tatlock, of 45, Renfrew Street, Glasgow.

The purpose of the instrument is, of course, to give means of taking a record of varying electrical measurements during a period of time. The apparatus consists of a D'Arsonval galvanometer, the suspended coil of which carries a metal pointer which is free to move over two metallic pieces insulated from one another. One of the said pieces is connected to one terminal of an electromagnet, and the other to one terminal of another similar electromagnet. The opposite terminals of each of the electromagnets are connected to one and the same pole of a local battery. The other pole of the battery is in connection with a movable metal arm, which by means of clockwork descends periodically on to the movable pointer already described, and clutches it between the arm and (1) either of the two metallic pieces, or (2) the insulation, according to the position of the pointer. In the first case the circuit of the local battery will be completed



NEW AUTOMATIC RECORDER FOR HIGH TEMPERATURES.

either through one electromagnet or through the other electromagnet, and in the second no contact whatever will be made.

The keeper of one electromagnet is attached to one side of a lever, which is pivoted at one end, and the keeper of the other electromagnet is attached to the opposite side of the same lever. On the opposite end of this lever from that on which it is pivoted there are two loose clutches, placed one on either side or arm of the lever, and with the point of each turned inwards towards the other. Both clutches are almost in gear with a toothed wheel, so that on the lever, already described, being moved in one or the other direction (according to which electromagnet is influenced by the current from the local battery), the said wheel is moved in the same direction. The lever is made to resume its original and normal position by various means, such as its own or applied weights or springs, and in doing so will not move the toothed wheel above-mentioned.

Attached to the toothed wheel is a shaft, one end of which moves a pen or other marker on recording paper, which is arranged in the usual way. The current to be measured passes through the galvanometer, deflecting the pointer, according to its strength, and the other end of the shaft is geared and attached to the top of the galvanometer suspension, so that it undoes the torsion caused by this deflection, and so brings the pointer to its original position, *i.e.*, over the insulation.

The chart gives a complete record of the temperatures during 24 hours, and is graduated in Centigrade or Fahrenheit degrees.

When at work the record is almost entirely visible. The instrument can be used at any distance from the source of heat, to which it is connected by copper wires.

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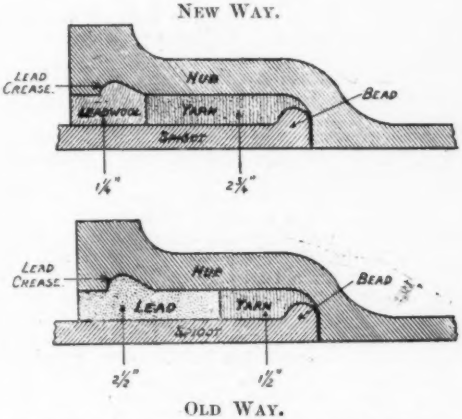
MANUFACTURERS of anvils, traction plant, wheels, stoves, grates, and ranges, etc., who are not on the War Office list, and who may wish to be invited to tender for army requirements, are being invited by the War Office to apply to the Secretary stating the particular articles which they manufacture, and the names of at least two well-known firms or public bodies who have purchased from them, and are in a position to certify as to the quality of their productions.

LEAD-WOOL FOR CAULKING PIPES.

IN May, 1904, Aug. Buhne & Company, of Freiburg, Germany, began to supply the gas works of that country with "blei-wolle" (lead-wool) as a substitute for melted lead in making joints for hub and spigot cast iron gas mains. This "blei-wolle" is lead which has been shredded to about the size of heavy thread, collected into bundles of convenient length and of a size in proportion to the joint to be filled, twisted somewhat, and caulked cold into the joint against a backing of hemp or tarred yarn, as usual. Works have been

NEW WAY.



OLD WAY.

SECTIONS SHOWING RELATIVE QUANTITY OF LEAD REQUIRED BY THE TWO METHODS.

established at Snodland, in Kent, for the manufacture of this lead-wool by the Lead Wool Company.

As to the material itself, it can be appreciated better by an examination of samples than by description. The idea seems to be to obtain a spongy joint which shall fill the space close up to the confining surfaces and touch the whole surface. It is claimed that lead contracts on cooling from its molten condition when poured into the joint, and leaves a space between itself and the pipe; also that caulking only spreads the outer portion of this lead, leaving the inner part free to leak. It is also claimed that the yarn in the joint is not compressed sufficiently in the melted lead joint, but that in the lead-wool joint the

strands of lead are packed as they are put in, thus keeping the yarn under compression and filling the joint perfectly full of lead for its entire depth.

To accomplish this end a strand of lead-wool is inserted in precisely the same way that the yarn had been put in and caulked with the three caulking tools in order. These tools do not have square ends, but are dull pointed, having V-shaped ends which tend to spread the lead against the pipe. Then another layer is inserted, caulked, and so on, until the joint is filled. The caulking solidifies the lead and yet leaves it free to adjust itself, so that when the joint is deflected the lead and yarn adjust themselves and still fill the space. In caulking, the lead should be forced from the spigot toward the hub by the tool rather than spreading equally.

With lead-wool there is more yarn and less lead used than with a poured joint About 75 per cent. as much lead is used per joint, but skilful caulkers will require less. As shown in the illustration, about half the depth of lead is necessary, but careful caulking is essential.

According to German practice, a 4-in. pipe has a lead-wool packing 1 in. deep and weighing 1.9 lbs.; an 8-in. pipe, 1.2 in. deep, weighing 4.3 lbs.; a 12-in. pipe has a lead joint 1.3 in. deep, weighing 7.5 lbs., etc. According to some English figures, a 6-in. pipe has a 2-in. deep poured joint weighing 7 lbs., and a lead-wool joint 1.2 in. deep weighing 3.2 lbs.; a 12-in. pipe has a 2.4-in. poured joint weighing 18.5 lbs., and a 1.4-in. lead-wool joint, weighing 7.5 lbs. A number of other figures might be given, but these will show the saving in the quantity of lead used. According to some tests made at the Mannesman Tube Works the joints withstood enormous internal hydrostatic pressure, the 3-in. pipe joint just beginning to give way at 3,450 lbs. per square inch.

A few suggestions as to the advantages of this method of making joints may not be out of place here. When caulking pipes partly submerged, molten lead would cause trouble, but lead-wool would offer no serious difficulty. Also in locations where gas was leaking badly it would be dangerous to bring nearby any highly heated substance for fear of explosion or conflagration. Then, again, the lead-melting kit may be in use elsewhere, may be too cumbrous to take on a "hurry-up" job, or too heavy for small fitting or plumbing jobs, while a few strands of fibrous lead would be carried with ease. The nuisance of clay bands, drying out of joints, insufficient lead melted, imperfectly fitting bands, etc., is avoided by the use of lead-wool. Really, the purpose of the lead should be largely to keep the oakum or yarn in place and under pressure.

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THE GERMAN CAST IRON PIPE SYNDICATE.

A FEW years ago the German Cast Iron Pipe Syndicate (Deutsches Gussrohren Syndikat) was formed as a share company at Cologne, and as it was renewed at the beginning of this year until March 31, 1908, some particulars respecting its constitution may be of interest. The agreement provides for the holding of meetings at least once a quarter for the transaction of business, which is conducted by the Chairman of the Council, and each member has a vote for each unit he possesses in the total allotments. The Council is composed of a minimum of six members, and each works having at least 10 per cent. of allotment has to nominate in January of each year a member of the Council and a substitute, and these appoint the managing committee. Where the works do not reach this particular allotment it is possible for them to combine for the purpose, but in case of failure the councillors already elected select the remainder from the works not represented on the Council, who are authorised to act when five are present.

The parties to the agreement undertake to sell to the Syndicate—with one exception—all their output of cast iron socket pipes and junctions, "waste" pipes, even if shorter than the standard length, pipes for underground mains in so far as cast iron pipes of standard dimensions are used, and even of less weight than the standard weight in a proportion of 10 per cent. and 10.1 to 15 per cent. This arrangement applies to all inland requirements, including the free ports, but exclusive of Luxemburg. In return the Syndicate undertakes to purchase the products and dispose of them in accordance with certain conditions. The exception relates to socket pipes of abnormal section, reduced thickness and merchantable short lengths. The Syndicate can authorise beforehand the works to forward

directly to buyers for its account small orders of not more than 10 tons at a price to be settled on the spot. In this event the works concerned has to intimate to the purchaser that the seller is the Syndicate, and has at once to advise the latter of the delivery. The total of these deliveries is to be submitted at each meeting of the Council, and the quantity is to be added to the amount of the allotment. With the exception in question, the parties to the agreement undertake to abstain from any direct sales of pipes, and all orders or inquiries received by them direct are to be submitted to the Syndicate for execution. The pipes used for the private purposes of each works have to be brought into account, and indicated to the Syndicate every month. The Syndicate has the right of requiring the cooperation of any works for the conclusion of a contract or the making up of a deficiency.

Each pipe founder has rights in the matter of his own production only within the limits of the amount of his allotment. When new firms are admitted to the Syndicate the Council fix the percentage of their allotments, and they inform the meeting of members of their decision, and the old allotments are proportionately reduced. The makers are not to seek to increase their production by extending their plant or by new works, except with the consent of the managing committee. It is possible for the latter to reduce an allotment in case of a *bonâ fide* application being made by any one works. If the market conditions allow it, the Council may decide upon an increase or a reduction in the aggregate allotments, and in this case the decision is communicated by registered letter to the managing committee and the members. Each member can require the deliveries to be made as far as possible with monthly regularity in proportion to the amount of his allotment. When the sales are not in accordance with allotments, those works which are in excess have to pay to the Syndicate a fine for the quantity sold in excess, while those which are in arrears receive an indemnity from the Syndicate for the less quantity sold on their behalf, on condition that it is proved that they were in a position to effect delivery. These matters are regulated monthly by the managing committee, and the amount of the fine or indemnity per ton has always to be equal.

The Syndicate occupies the position of sole buyer in relation to the makers, and of sole vendor in respect of the clients. However, regard has to be had as far as possible, first to the geographical situation, and secondly to the customers of the various works. The pre-arranged purchase price is to be paid to the works by the Syndicate, but the latter takes the risk of the sales which it carries out. The maker entrusted with an order is only responsible for the good and regular execution; he has to lodge the requisite deposit and bear on his own account all the expenses of bad work or defective quality or any other fault in the execution of the work, the final decision in case of dispute resting with the Council. The sale price to the Syndicate is fixed for each contract, and for each article. It is based upon, in the opinion of the ironfounders, the rates obtainable in the market under normal conditions, and the prices are definitely settled at the members' meeting on the freight basis of Brebach, with an increase of 5s. per ton on the freight basis of Cologne and Gelsenkirchen, 10s. advance on that for Hanover, 20s. on that for Berlin, and 25s. per ton on that for Gleiwitz, Waldenburg, Konisberg, Dantsic, and Stettin. The basis price for Brebach is the lowest rate which the Syndicate can offer to buyers, except when the interests of the Syndicate require lower quotations in exceptional cases.

The agreement further provides that the works which desire to export pipes are, as much as possible, to pass the business through the intermediary of the Syndicate. In this case the part played by the Syndicate is limited to ratifying the contract and controlling the deliveries which, however, do not interfere with the allotment of the works concerned, for the inland market. The invoices prepared by the works are presented to the purchasers by the Syndicate, which asks them to settle directly with the firm supplying the pipes.

A statement of the deliveries effected by all the constituents is drawn up by the Syndicate, and a copy is forwarded monthly to each member. Should any maker not be able to comply with his engagements owing to interruption in working, etc., he has to at once inform the Syndicate and cite the cause and the presumed duration and extent of the interruption. The Syndicate then has the right to have recourse to the other works to meet the deficiency, but the de-

faulting member has no ulterior right of compensation, although this may be granted by the Council as a matter of equity in certain cases.

The Council retains from the monthly accounts a certain proportion, the amount of which is determined according to the requirements on the proposal of the managing committee, in order to defray the expenses of management and eventual losses of the Syndicate. The managing committee are entrusted with the control of the expenses, and the examination of the books and documents of the works in so far as the sale of syndicated products is concerned. On the other hand, any properly authorised representative of any works has the right of informing himself in regard to the books and documents of the Syndicate in so far as the interests of the Syndicate would not be compromised by the fact. Various monetary penalties are provided for any contraventions of the regulations already set forth, and in the event of omission to pay the fines, the amount is deducted from the deposit lodged by the member or members concerned. The sale or transfer of works does not free the original owner from his obligations during the currency of the agreement, heavy penalties being imposed for any infraction. As a guarantee for the fulfilment of their obligations the members each make a deposit with the Syndicate of securities or drafts not exceeding £250; and the total security amounts to £200 per unit percentage of the allotment granted to them.

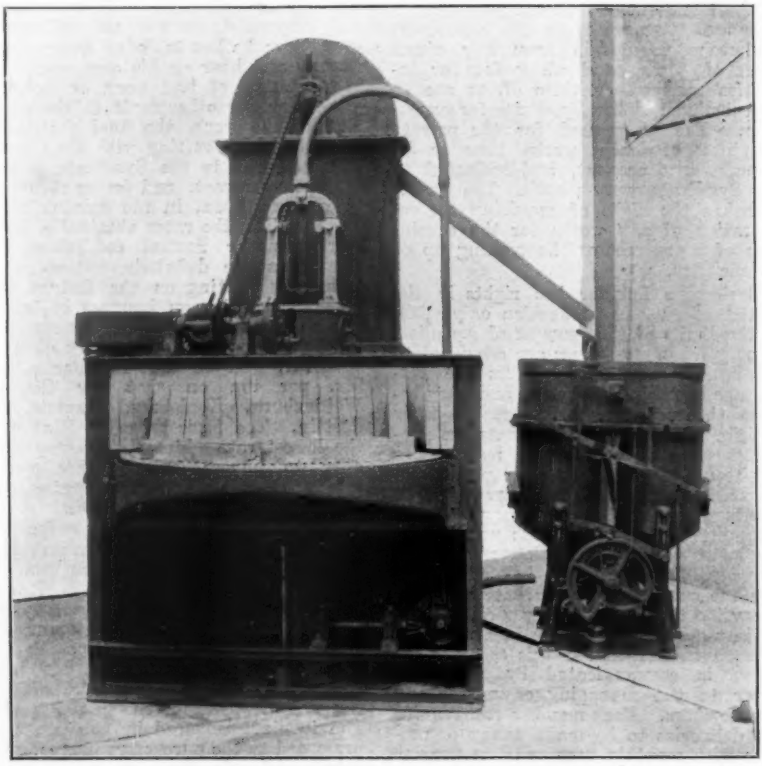

FIG. 5.—ROTARY TABLE MACHINE—LONDON EMERY WORKS CO.

CLEANING CASTINGS WITH THE SANDBLAST.—II.

A COMPLETE sandblast rotary table plant, by the London Emery Works Company, of Park, Tottenham, is shown in Fig. 5. Here the air is compressed to 17.5 lbs. pressure by a vertical compressor, and is delivered to a receiver, where the condensed water can be drained off, and then into the double pressure apparatus containing the quartz sand. A fixed pipe conducts the mixture to the swing nozzles above the rotary table, where the blast acts on the pieces that have been laid on the uncovered portion of the table and carried round by the latter, underneath the double curtain made of strips of rubber. As they come from under the curtain again, the pieces are either turned, to expose the other side, or are removed as finished. The dust produced by the sandblast is drawn off by a powerful exhaust, whilst the sand drops through the grating of the table and is returned to the mixer by an elevator, the wastage being replaced by fresh sand through a hopper on the elevator casing. The change from one chamber to the other in the double pressure apparatus can be effected by a lever automatically operated by the shaft of the revolving table.

The double pressure apparatus (Fig. 6) consists of two sand chambers placed side by side, the lower portion of each ending in a funnel and a sand cock, common to both, connecting them to the mixing chamber. While one chamber is at work the other is filled with sand and made ready for use. After emptying the first chamber the lever which regulates the air valve is reversed, transferring the pressure to the full chamber, and thus enabling the work to be carried on continuously. The air pressure in the sand chamber is greater than in the mixing chamber, and in consequence of

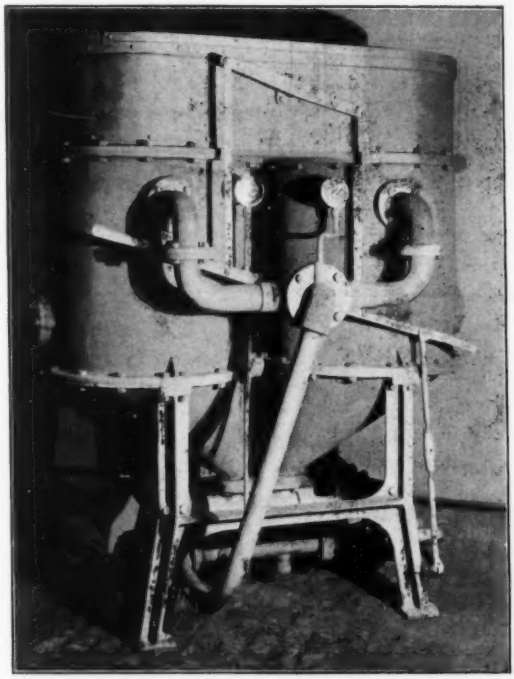

FIG. 6.—DOUBLE PRESSURE APPARATUS—LONDON EMERY WORKS CO.

this higher pressure the sand does not sink through its own gravity only, but attains a higher velocity, and, consequently, choking of the apparatus is prevented. The inside is accessible by hand-holes, with peep-holes, through which the height of the sand can be seen The two chambers are covered by a removable sand sieve. The stream of sand produced in the mixing tube is carried by fixed piping to a rotary table, rotary drum, or other special apparatus.

It is claimed that a sand stream produced by this double pressure apparatus is four times as powerful as a sandblast working on the suction system. This plant is also suitable for dull-finishing brass and bronze articles.

Fig. 7 shows the "Jacket" apparatus of the London Emery Works Company. It is a combination of the standard double pressure apparatus with a sheet iron cleaning chamber. The stream of sand produced in the mixing tube is carried by hose into the cleaning jacket. The sand is blown upwards by a chilled nozzle, which can be easily replaced. The dust is removed through an ejector at the top of the jacket, whilst the sand drops and re-enters the sand chamber. At the back of the jacket is an opening arranged with a sliding door for insertion of the articles to be treated and also for replenishing the sand. Inside a gridiron is fitted to take the castings. In the front are two holes through which the operator passes his hands when cleaning the castings, and above these a window is placed. Large and heavy pieces must be treated by disconnecting the sand tube where it enters the jacket and lengthen-

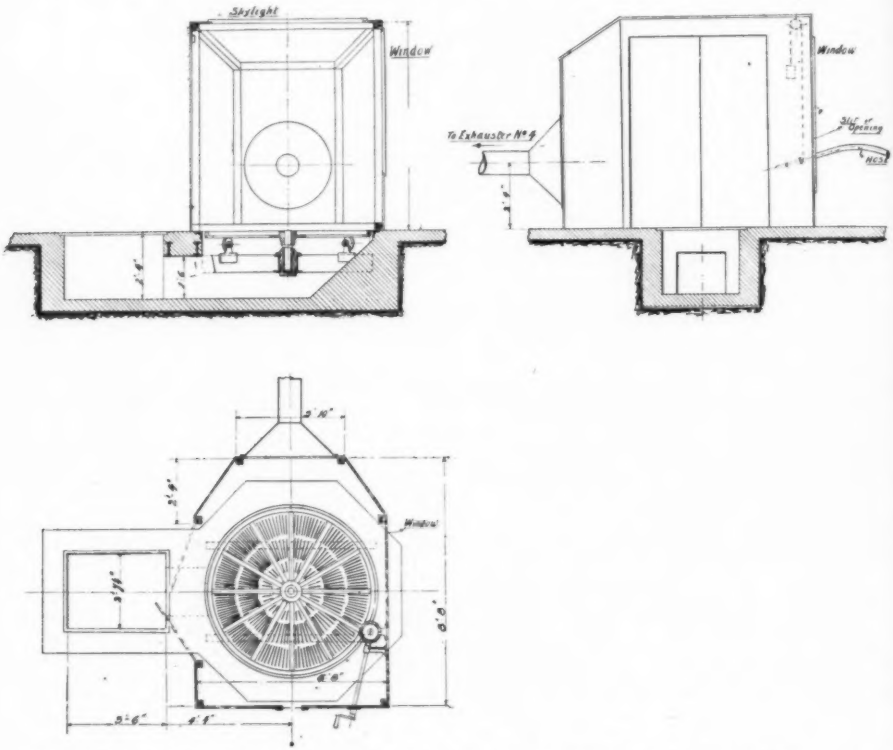

FIG. 8.—ELEVATIONS AND PLAN OF CHAMBER FOR "FREE STREAM" SANDBLAST CLEANING.

ing same by adding flexible tubing with nozzle attached. One of the great advantages of this apparatus is that for small work it is used enclosed, and for large and heavy castings it can be used as an open sandblast.

The "Jacket" cleaning apparatus is

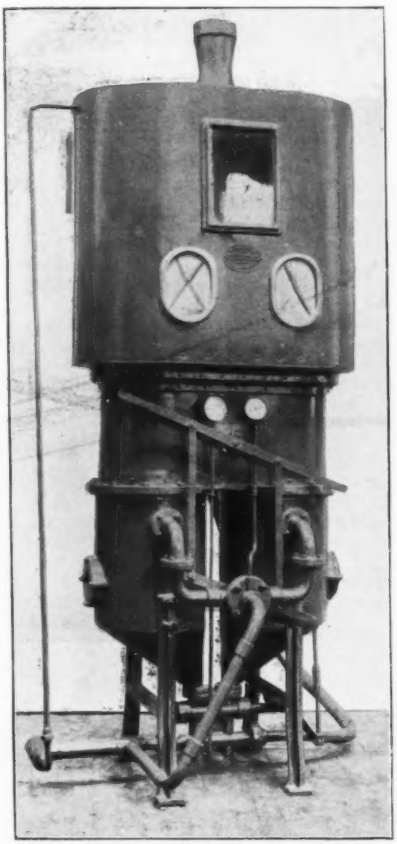

FIG. 7.—DOUBLE PRESSURE APPARATUS WITH CLEANING CHAMBER.

most suitable for small or medium sized foundries. The castings have perfectly clean surfaces when treated. The machine should be about 18 in. below floor level, or else have a staging built round it in order to have the cleaning holes at a convenient height. An installation requires from 5 to 6 h.p. The blast is furnished by a vertical double-acting compressor, the air being drawn in through a central suction valve in the upper piston rod from the outside, so as to obtain cooler and drier air than that of the workroom.

Castings, which on account of their size and weight cannot be cleaned on a rotary table or other special apparatus, are cleaned by means of a "free stream." In order that this can be done without causing any annoyance by dust it is better that a cleaning room be erected similar to the one shown in Fig. 8. The room should be made perfectly dust-tight, and either wood or iron can be used.

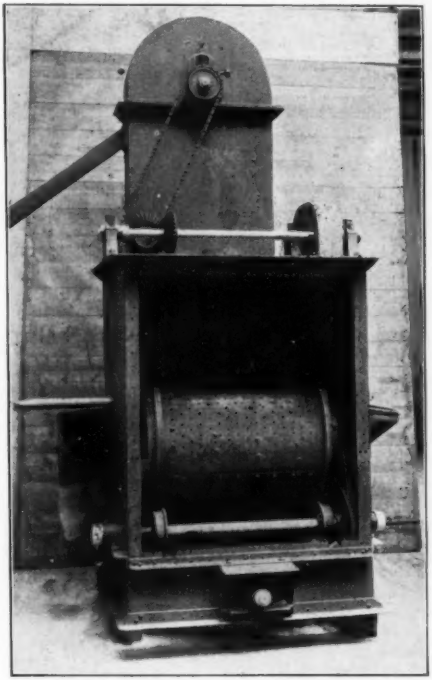

FIG. 9.—CLEANING DRUM—LONDON EMERY WORKS CO.

The castings are brought into the room through a closely fitting door, and placed on a turntable. The door is then closed and the workman plays on the castings with a well-balanced nozzle from the outside by means of a slit in the wall, and as the work advances he gives a turn to the turntable by the winch provided. The dust produced is drawn away by an

exhauster, whilst the sand drops through the grids of the table and is easily removed from time to time. There is a window placed over the slit through which the hose is carried, to enable the operator to watch the cleaning process.

The room should be lit by a skylight, and, if possible, by side windows also. A cleaning room erected on these plans protects the workman against every inconvenience caused by dust and greatly increases the comfort of working sandblast appliances. The size of the exhauster depends upon the size of the free stream nozzle used. To make the room more complete a conveyor and elevator could be installed to carry the sand back to the double pressure apparatus. The London Emery Works Company make three sizes of these cleaning rooms.

The same firm also brought out a cleaning drum, Fig. 9, which consists of a strong iron case in which is an open perforated drum rotating on two rollers. The castings are carried into the drum, whilst same is in rotation, by a hopper fixed on the outer case, and inside they are carried forwards by a spiral conveyor fixed on the side of the drum. In this way the castings pass at equal distances in consecutive order several fixed nozzles, and leave the drum by an opening on the other side of the case.

The chief advantage of this new cleaning drum is that the castings are cleaned without it being necessary to move the nozzles, doing away with all the disadvantages connected with this movement. The drum has no stuffing boxes, links, or flexible piping which could lead to inconvenience. The supply to the cleaning drum from the pressure apparatus is effected through fixed piping. The small case-hardened nozzles, which are held in a simple manner by a hook bolt, are accessible by a door, and can be easily changed. The dust from the sand is removed by a powerful exhauster, whilst the sand, which is still fit for use, drops through the perforations of the drum into a spiral conveyor to the elevator which carries it back to the pressure apparatus. By these means the drum works without any dust. This drum is connected with the double pressure apparatus described above.

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MR. J. WHITFIELD, of the Sun Fan Company, has been appointed manager of the Shipley Fan Company, of Wellcroft, Shipley.

KNOXALL.

THIS preparation, the invention of a German chemist, is a new material for treating sand moulds for steel castings; it is widely used by the German steel foundries, and has lately been put on the British market.

The heat-resisting powers of Knoxall are so great that it is not affected by the highest temperatures of molten steel. It is important for washes or facings with which the surface of sand moulds for steel castings are treated to have sufficient resistance to the temperature of molten steel, as otherwise they may form a flux which serves to fuse the mould sand to the surface of the casting, making its removal a costly and laborious process. Even after the most thorough treatment by sandblast, tumbling, brushing or fettling, steel castings frequently show a surface more or less rough. Such castings are always difficult to machine.

The fusion of the sand preventing the proper escape of the gases, especially in complicated castings, is the real cause of blow holes, and accounts for the large percentage of wasters which have to be thrown on the scrap heap.

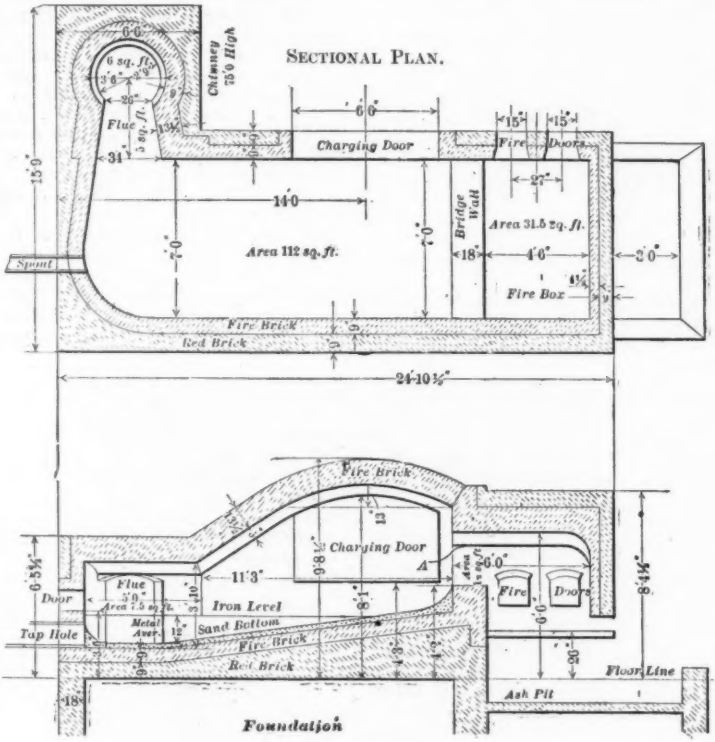
Knoxall has been adopted by a number of foundries in Germany after exhaustive tests, and it is claimed that when the moulding surfaces of the sand have been treated with Knoxall sound castings are obtained, combining freedom from blow holes with a smooth surface. Wasters are rare, and the bulk of the cost of fettling is saved. As a proof of this, it is stated that one of the large German steel foundries, since adopting Knoxall, has been able to reduce their staff of fettlers from 120 men to 60. The application of Knoxall is exactly the same as with other washes. The sand is knocked off with a few blows of a hammer, scaling off like a shell, and leaving a smooth surface free from blow holes. The reason for this is that Knoxall forms a porous zone between the sand and the casting. The sand never comes into pvhsical contact with the molten metal, the surfaces of the casting are clean, and the porous skin between the steel and sand formed by Knoxall allows the gases to escape and thus prevents blow holes. Messrs. J. W. Jackman & Company, Limited, of London, Manchester, and Glasgow, have acquired the sole rights for Knoxall in the United Kingdom.

COMPARATIVE DESIGNS AND WORKING OF AIR FURNACES.*

By Ralph H. West.

There are many different designs of air furnaces, and all are governed by the experience derived in getting the flame most effective with the least consumption of fuel, to obtain the greatest durability in lining of the furnace, the tonnage required, the character of the fuel, the supply of air, as well as the draught to obtain the best economy in fuel and speed in melting.

Some of the firms using air furnaces, and hence knowing their advantages, have from two to six in their foundry. There are firms who having two furnaces and requiring but one heat per day will run same alternately, others will take a heat out of the same furnace daily. The advantages of an air furnace over a cupola are:—First, in enabling a founder to obtain lower sulphur in remelts. Second, in affording an opportunity to change the silicon, manganese, phosphorus or total carbon contents of the heat while in a melted state. Third, in permitting the obtaining of large bodies of "hot metal" at one tap. Fourth, in obtaining a stronger product from the same brands of iron through the refining action, freedom of contract from fuel, and the ability to manipulate the metal before it is tapped into the ladle. Fifth, in melting large bodies of



Sectional Elevation.

Fig. 2.—Camel-back Air Furnace—Capacity 15 Tons.

* Abstract of a Paper read before the American Foundrymen's Association, at Cleveland, Ohio, in June, 1906.

broken castings or scrap that could not be charged into and melted down in a cupola.

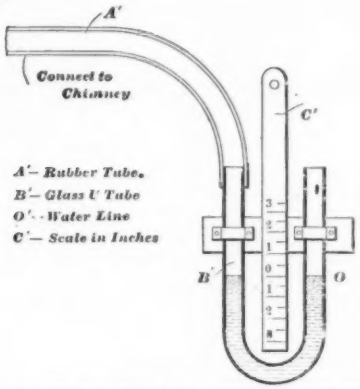


FIG. 1.—DRAUGHT GAUGE; SECTIONAL VIEW.

It requires greater skill and care to operate an air furnace than a cupola. There is everything in working the fire, hard firing at the expense of loss in silicon, etc. A novice may attempt to take a heat out of the cupola and be successful, but should the same person try his hand at an air furnace, his chances would be excellent to make a very expensive fizzle.

Owing to air furnaces generally depending upon natural draught to promote combustion, the state of the atmosphere has much to do with the speed of melting, and obtaining of "hot metal." Again, the same area and height of a chimney will not suffice for the same style furnace in all localities. The variations of surroundings in the matter of hills or high buildings that can affect the force of winds, can cause a more variable action in the speed and quality of the melting, than where a chimney is free from such influences.

In Fig. 1 there is shown a draught gauge that is a very valuable appliance to use. There are times when doubt may exist as to whether some trouble is due to the fuel, the draught, or the furnacemen; but by the use of such a gauge it is at least possible to define how far the draught was responsible for poor results and narrow the investigation to two factors, the coal and the melter.

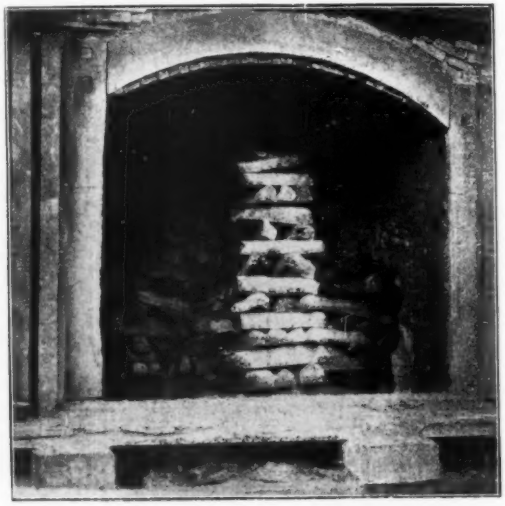
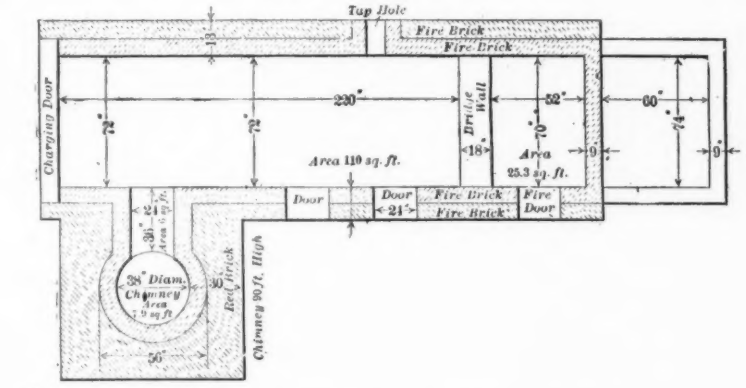


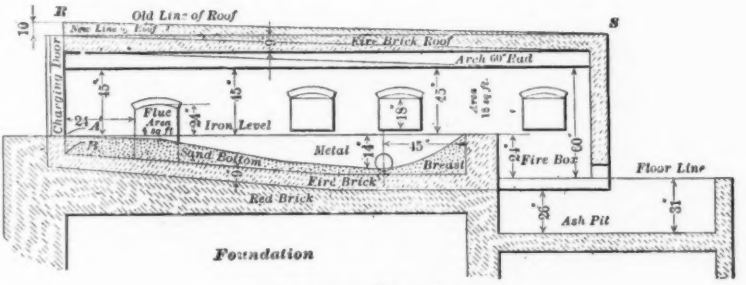
FIG. 5.—VIEW OF CHARGING END OF 45-TON AIR FURNACE.

and every precaution must be taken to ensure the iron coming down "hot" at the start. If this is not accomplished the temperature can only be raised by

In taking up a review of this subject, the following firms tendered a report on the designs and workings of their furnaces :—Bethlehem Steel Company's iron foundry; Buffalo Foundry Company; A. Garrison Foundry Company, Pittsburg; Lorain Foundry Company, Lorain, O.; Watertown Arsenal, Watertown, Mass.; Westinghouse Machine Company, East Pittsburg, Pa.

SECTIONAL PLAN.





SECTIONAL ELEVATION.

FIG. 3.—AIR FURNACE—CAPACITY 10 TONS.

In taking up the furnaces in the order of their number, we first have Fig. 2, which is of the design known as the "camel-back." The firm owning this furnace has two of them and operates them alternately. In making the bed or furnace bottom silica sand is used, the depth ranging from 1½ in. to 6 in., according to the size of the heats, so as to always maintain the same level of slag line as far as practicable. To make room for the large heats the minimum depth of sand is used. All the sand is never taken out, merely enough to remove such bodies as may cling to the slag. For ordinary heats about two wheel-barrows of new sand will renew the bottom in good shape. Slab lumber is used to pile iron on and thus protect the bottom when charging the furnace. No trouble has ever been experienced with the bottom. The heaviest iron is charged right behind the bridge wall as near the fire-place as possible, which, by the way, is the hottest place in the furnace.

The greatest burning out of the lining occurs in the throat right over the bridge wall in the top, as at A.

Unscreened coal is used. Every carload is refused if found to contain sulphur higher than 1.30. As a rule it ranges from 0.85 to 1.10. The melting ratio averages about 3½ lbs. of iron to one of coal. It generally takes 6½ to 6¾ hours to melt down 24,000 lbs. The charge consists of old rolls and charcoal pig-iron.

The first iron commenced to melt about two and a half hours after starting the fire. The iron when all melted is "very hot."

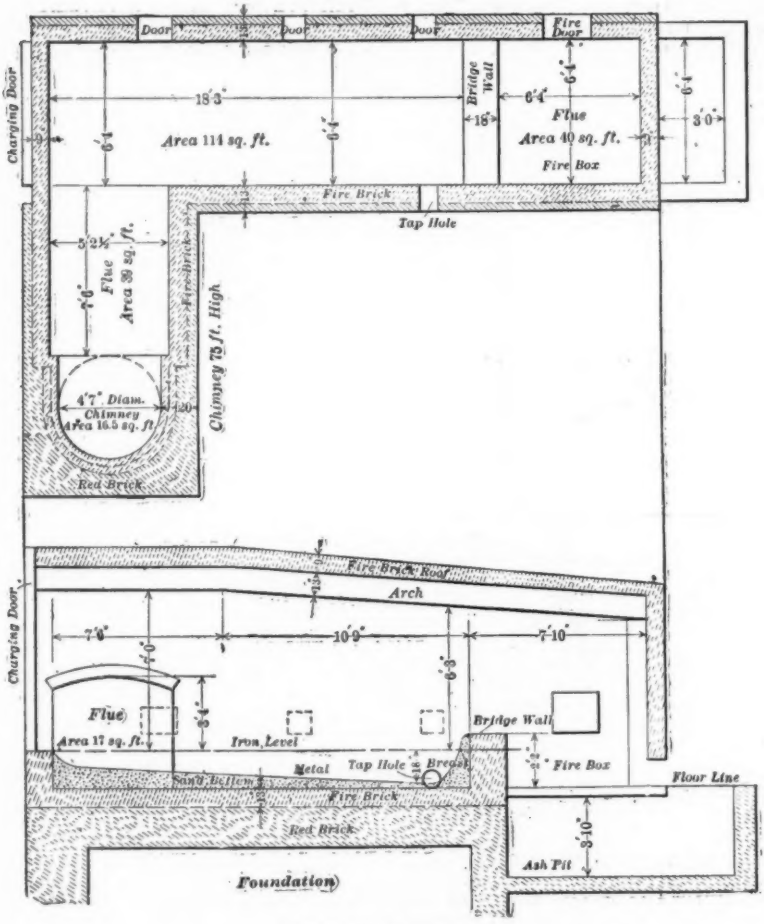
It will be well to state at this point that the state of fluidity is designated as "dullish," "medium," "hot," and "very hot."

For patching material, fire clay, lake sand, and pieces of old fire bricks are used. A whole new arch is needed at least once a year. The end charging furnace is preferred.

Ten-Ton Air Furnace.

This furnace, as shown in Fig. 3, has a straight level top. It was originally 10 in. higher at the charging end, as in keeping with the lines R S. The end at R was recently brought down to the level shown, because the flame drew

SECTIONAL PLAN.



SECTIONAL ELEVATION.

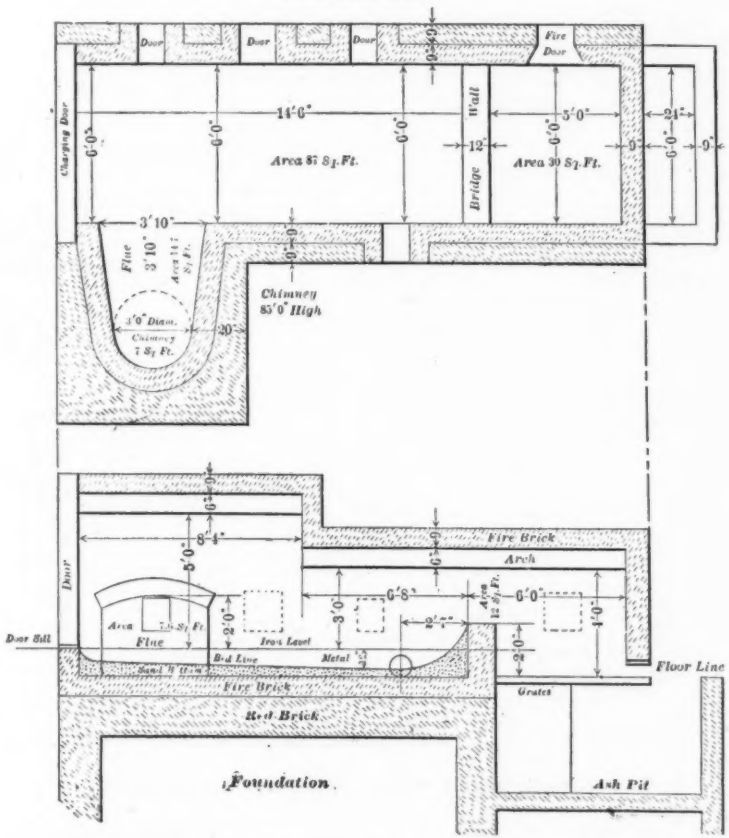
FIG. 4.—AIR FURNACE—CAPACITY 45 TONS.

along the top so much that good "hot iron" could not be obtained.

In filling the bottom a good brick foundation 13 in. thick was put in, and then silica sand was put in about 3 in. thick at a time and burned the same as is done in open-hearth furnaces, until the remain after the cast is taken out, does it require any patching. The heaviest iron is charged on the high part of the bottom, just in front of the flue. This is the hottest place in the furnace for melting.

For patching the slag line etc., a good

SECTIONAL PLAN.



SECTIONAL ELEVATION.

FIG. 6.—PITTSBURG TYPE OF AIR FURNACE—CAPACITY 22 TONS.

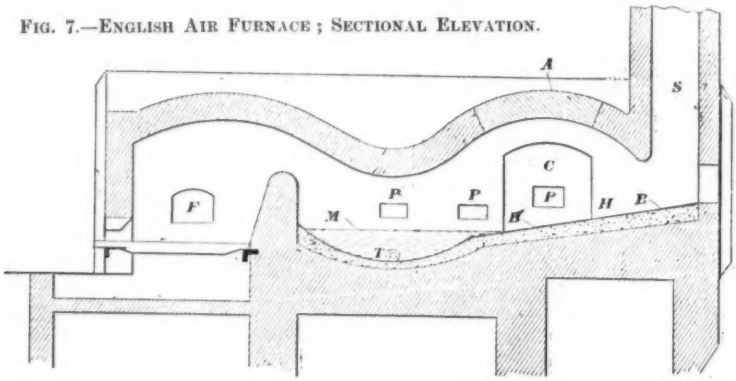
shape required was obtained. For patching up any holes, sand the same as is used for cupola bottom is utilised. This silica sand was about 12 in. thick at the lowest place. No trouble has been experienced with the bottom and only at the tap hole where the cinder and iron ganister lining material is used and works very well. Unscreened bituminous coal is used, but the big lumps are broken to be no larger than a cocoanut when charged. The greatest burning out aside from the slag line occurs at the flue entrance and between the side doors.

A heat of heavy hard scrap and pig-iron, taken on April 19, 1906, gave ten and a half tons in six hours at the melting ratio of about 1 to 4. The first iron was seen to melt about one hour after starting the fire. The iron was not tapped until one hour and thirty minutes after it was all down, and was "very hot."

scrap would have great difficulty in attempting to do this with end charging furnaces. Burnt core sand taken from the chipping shop floor is used for making the bottoms.

In a heat taken on April 10, 1906, out of the furnace shown in Fig. 4, thirty-five net tons were run down in nine hours. The first iron was seen to melt in

FIG. 7.—ENGLISH AIR FURNACE; SECTIONAL ELEVATION.



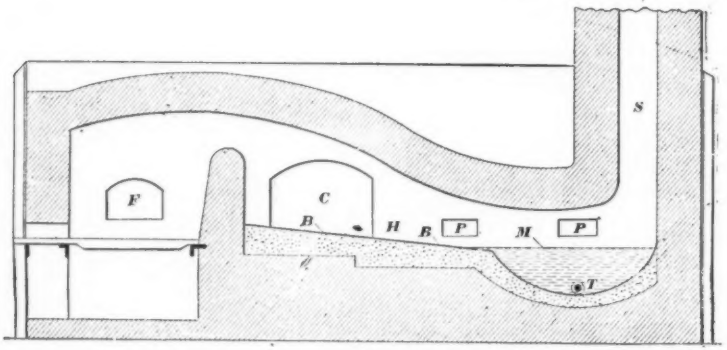


FIG. 8.—ENGLISH AIR FURNACE; SECTIONAL ELEVATION.

45-Ton Air Furnace.

This furnace may be called a combination of the Pittsburg furnace and the camel-back. It is shown in plan and elevation in Fig. 4. Fig. 5 shows the charging end filled with pig-iron, and the furnace ready to be closed.

A charging beam is used for this furnace, and by virtue of this device the heavy iron is charged up as close to the bridge wall as possible. Those not having such facilities for handling heavy

forty minutes after starting the fire. The iron, when all melted, is reported as being "hot." The iron charged was heavy machinery scrap. For this heat 3⅝ lbs. of iron were melted with 1 lb. of coal. A later heat of twenty-five tons used 12,705 lbs. of coal, or a melting ratio of 4 to 1; forty 5-ton heats have been melted down at the ratio of 5 lbs. of iron to one of coal.

For a later heat than recorded above, the device as shown in Fig. 1 was used

for measuring the draught by entering the chimney near the base. When the furnace first started to melt, a ¾ in. draught was recorded, and at the close of the heat, when the furnace was the hottest, a 1 in. draught existed.

It is stated that the hottest part of the furnace is just behind the bridge wall, and from that point to about 5 ft. from the bridge. The greatest burning out of the furnace, Fig. 3, is said to be on the sides of the fire box, rather than the roof. The furnace is run daily, and the cost of lining or repairing, averages about £4 17s. per month. The owners state that they are now using two parts of silica sand and one part of fireclay, and making preparations to grind up fire brick bats to be used with fireclay for patching purposes.

Much stress is laid on the character of the roof shown. It is said :—"We believe this form makes a stronger roof and a stronger furnace; that the roof does not give way so easily; that the ease of charging is increased, and that in general it is superior to the usual method of making the roof in two distinct heights, as shown in Figs. 6 and 7, which are modifications of the regular Pittsburg type."

Pittsburg Type of Air Furnace.

The type of furnace shown in Fig. 6, in a heat on April 18, 1906, melted down sixteen tons of gun iron with seven tons of gas coal. The iron was seen to first melt one hour and fifteen minutes after starting the fire. The iron was melted "hot." When running this furnace to its full capacity, 22 tons, the ratio for fuel is quoted as 1 to 2.75. The users state :—"We charge the heaviest iron at the middle of the furnace. Greatest burning out is found at the slag line, and on the sides near the flue. Jersey fire sand and clay is used for patching. In a recent melt we determined losses in the following constituents : Silicon 0.17, manganese 0.18, carbon 0.035. The gains were : Sulphur increased 0.001 and phosphorus 0.014. The slight changes in sulphur and phosphorus may be due to error in chemical analysis."

English Types.

The illustrations, Figs. 7 and 8, are presented to show the designs of furnaces more commonly used in England.* Fig. 9 is given the preference.

* Derived from views shown in "Modern Iron Foundry Practice," published by D. Van Nostrand Co.

While it appears good logic that the air necessary to support combustion should, in passing through the fuel, be directed as much as possible upon the metal lying on the bed by the curve of roof, still for all this such designs as Figs. 7 and 8, would seem to be better in theory than in practice; contrasted with Figs. 3 and 4 it will be noted how there is a tendency to simplify the contour or curvature of the interior roof lines of furnaces.

It is unfortunate that there are no data for the working of furnaces, Figs. 8 and 9, as these would be valuable in enabling us Americans to know where we stand with our English cousins in the question of economy in fuel and speed in melting.

From what information can be obtained on the question of grate surface areas used some years back, it appears that it was figured to be about equal to that of the chimney. With our modern furnaces it will be seen by noting the areas given on the illustrations shown, that the present day practice is to have a very much larger grate area than that of the chimney.

Many different kinds of fuels, such as wood, coke, and hard coal, have been used, but the latter two create large quantities of fine ashes, that fall and cover the molten metal so as to prevent the proper absorption of heat. The best kind of fuel is a fairly hard, gaseous, long-flaming, non-coking, bituminous coal, that does not contain over 1 per cent. of sulphur.

While there is much in preparing and charging a furnace that might be taken up here, this much can be said, that the operation of firing, to create and regulate a reducing or oxidising flame (the former being a heavy white flame, and the latter a bluish cast similar to that which emanates from cupolas), is what requires the greatest care and skill on the part of the melter.

——o——

Mr. T. Corbett, of the Perseverance Iron Works, Shrewsbury, has been invited to accept nomination to the Mayoralty of the borough.

Mr. W. H. Patchell, engineer-in-chief of the Charing Cross, West End, and City Electricity Supply Company, Limited, has started in private practice as consulting engineer at Caxton House, Westminster, S.W.

BRITISH FOUNDRYMEN'S ASSOCIATION.

Birmingham Branch.

The Birmingham Branch of the British Foundrymen's Association commenced their autumn series of meetings at the Technical School, Suffolk Street, Birmingham, on Saturday, October 20, under the presidency of Mr. R. Buchanan, who is President of the Birmingham Branch. Nearly fifty members attended. Mr. J. H. Stansbie, B.Sc., F.I.C., read a paper on "Carbon in Cast Iron." To bring the paper within the comprehension of elementary students, it was largely of a class character, dealing with elementary stages of metallurgical study. The lecturer described the three forms of carbon—amorphous, graphitic, and diamond—and exhibited specimens of the various forms, subjecting them to different tests with a view of showing their combustibility. Various experiments were also shown to illustrate the absorption of carbon by iron, and metal was immersed in hydrochloric, sulphuric, and nitric acid, to illustrate the value of these acids for analytical purposes. The differences of grey, mottled, and white pig-iron were also shown in regard to their carbon constituents, and the lecturer dealt at some length with the question of variety of result arising from energy relations. The method of manufacturing the microscopic form of diamond, which it was explained is the only form artificially produced, was described.

The lecture appeared to be thoroughly appreciated.

Professor Hiorns said that although the details of the lecture were familiar, he had found it interesting and profitable. He very earnestly counselled members to study the subject and take advantage of the metallurgical department, under Mr. Stansbie's guidance. The lecturer had succeeded in coming down to the level of the most elementary.

Mr. Foster enquired if the lecturer could give any reason for the difference in the calorific value of amorphous, and graphite, and diamond carbon.

Mr. Stansbie, replying, said the question was an exceedingly difficult one, which had engaged the attention of the most distinguished physicists in the world. He was sorry he could give no definite answer. It was apparently due to some difference in the arrangements of the molecules or atoms in the different forms of carbons. Exactly the same questions were being asked about that remarkable element radium, about which they heard very peculiar stories. For instance, there was a newspaper paragraph lately which stated that less than an ounce of radium would be sufficient to raise the whole British Navy to the top of Mont Blanc. But the writer of the paragraph forgot to say that it would take about a million of years for this energy to be developed. It was in that direction that scientific thought was developing. The physicist told them that atoms were not indestructible. They could be broken up into smaller particles, some of which would be corpuscles and others electrons, the latter being associated with electrical energy, whereas the corpuscles were without such energy. The speaker concluded with an earnest appeal to the members to become students of the class. The practical man, who studied principles and knew how to apply them, would do his work very much better. Anybody who wanted to do his work thoroughly would study principles at the same time as he followed his employment.

The discussion was followed by an exhibition of slides thrown on the screen of castings which were produced by Messrs. Belliss & Morcom for the electric lighting and power station at Summer Lane, Birmingham, recently opened by the Birmingham Corporation. In the absence of Mr. F. J. Cook, who is at the head of the casting department of this firm, Mr. Buchanan explained various points about the production of the castings. Some of them were of enormous size. The weight of one bed-plate was 20 tons, the casing 21 tons, the low-pressure cylinder 4½ tons, and the fly-wheels for the direct current sets weighed 25 tons. Other fly-wheels for the alternating current had heavy cast steel rim shrunk on, the total weight being 27 tons. Mr. Buchanan said the production of such great castings of the highest quality was a very creditable performance. This concluded the proceedings, and it was announced that arrangements had been made for a visit to the Summer Lane station by members of the Association on November 3.

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Considerable extensions are at present being carried out at Messrs. Taylor & Sons' Foundry, at Swansea.

LARGE STEEL TOOTHED WHEEL FOR A LANCASHIRE COTTON MILL.

THE large steel wheel rim, shown in the annexed illustration, was recently cast in one piece by the firm of Messrs. Wm. Jessop & Sons, Limited, of the Brightside Works, Sheffield. It is 26 ft. in diameter, weighing 12 tons after machining, and is intended for a Lancashire cotton mill. It constitutes a striking proof of the fact that, thanks to modern appliances available for foundry equipment, extraordinary dimensions and weight of castings cause little trouble to the up-to-date iron and steel founder.

LARGE STEEL TOOTHED WHEEL RIM FOR A LANCASHIRE COTTON MILL.

BRASS FOUNDRY ENGINEERING.

In this article I may say at once I shall confine myself to practical everyday work in the brass foundry.

Though the work is chiefly gun metal, bronze, etc., the above heading is fully understood.

It is very well for the brass moulders to be told that such and such metals and alloys melt at a certain degree Fahrenheit, and give the specific gravities of same, but whilst the information is of great assistance, I can imagine some of your moulder readers saying they would welcome a few practical articles at times, and in this I will endeavour to describe the methods adopted in making some of the varied castings coming under the above heading.

Let us take a slide valve for any kind of engine, stationary or portable; if for stationary, cores will most likely be required of great delicacy, and in order to meet these requirements wires must be prepared to follow out these cores. They should be made by an experienced man who solders them together and thus ensures the making of good cores. These being in turn made and dried in the ordinary way in the stove, should, after being dried, be blacked to be efficient and to make a clean job, in a mixture of pure plumbago and water not too thickly mixed up. This is best accomplished by preparing a core plate well sprinkled with parting sand, and then taking the cores when dried and deftly dipping them in the above mixture and placing them sharply upon the prepared core plate and then re-drying.

So much for the core as an aid to casting the valve. Next let us proceed with the moulding of the valve. The patterns of valves are often made up and include loose parts, especially in the cavity underneath, and care has to be taken in moulding same, nails and gaggers being often used to supplement the sand, and to get a good lift. When the mould is prepared, the cores are put into position, and in many cases nails are required to hold them in place, as many of them are overhanging. Where possible, have two gates extending from runner to the end of the valve, so as to fill in the metal rapidly when casting. At the same time I may say that the smaller valves need not be dried if made up in fairly dry sand; but in such cases, or where only skin dried moulds are the rule, great care is required in the casting of same. First see the metal has been thoroughly and quickly melted and alloyed, then the impurities will rise to the surface, which should have a covering of charcoal to exclude all gases.

In casting, at the commencement pour slowly and steadily, and as you proceed increase the lead, and at the finish keep a good flow and the head well filled by starting steady, and your casting is less liable to scab on the drag side.

The metal, or alloy, should be hard and dense, and free from blow-holes, and sometimes will be a mixture of "phosphor bronze," but such an alloy as the following will be found to wear remarkably well, viz.:—

Copper	...	...	...	...	83 lbs.
Tin	...	...	...	...	15 ,,
Spelter	...	...	...	...	1½ ,,
Lead	...	...	...	...	½ ,,

If properly alloyed, the cores will come out clean if valve is taken hot from the sand and blown, on account of the coating of plumbago.

Let us next take for our example a back gland. Many of these extend to 2 or 3 ft. in length, and in making up these a loam core has in many cases to be spun on the trestles and with the strickle board in the usual way, and presents no real difficulty to the ordinary core-maker. The moulding of same may present more difficulties, but if one or two points be borne in mind these may readily and easily be overcome. According to the length of the gland chaplets or brass studs must be used as a bearing for the core, when the mould is made, and in practice I find it best to put at least two of these top and bottom if the gland approaches anything like 3 ft. in length. These will ensure an equal thickness in the work, as in use the rod must work free, the only bearing for same being at the gland end of casting. Again, for freeing any gases in mould of long castings of this character it is wise to put a riser or flower at the extreme end of casting, the runner being, of course, at the gland end. Here on top of gland should be a riser pure and simple. One thing especially should be avoided, that is cold, half-melted or stiff metal, otherwise with all the above precautions your casting will turn out spongy and worthless.

The last kind of casting I will treat of here shall be the bearing brass. These perhaps, by being so common and numerous in an engineering brass foundry, are almost despised, and yet how many pitfalls there are to be found in the

making of them. Take the ordinary bearing brass, and see how many have at times been made and scrapped owing to the channel or journal side not clearing when bored out owing to a scab or gutter mark. In the first place most of these brasses are cast channel side downwards, and if so that is often where the trouble commences; there is no real reason to cast them in this way; they should be cast the other way up, and in the moulding great care should be taken to keep the sand as dry as possible; if it is intended to cast them green, and without drying them in any way, much expense and time can be saved by doing so, and with success, and by following out the above, scabs, etc., will become a thing of the past. Many other bearings are cast in bush form, and then after boring they are cut in two, making top and bottom bearings. In this case, as in making up bushes, cores are required and have to be made. These at first sight appear easy enough, but the desire in many cases seems to be to make up a firm unyielding core. This is just the thing that isn't wanted. In the making of such cores, refuse sand from the floor of the foundry and from the bosh of water where the castings are blown out, should be got together and sieved to get out wires, nails, etc.; then this sand should be milled, enough water being added at the same time to make it strong enough to make the cores. This will be found an ideal core sand for such work, the gases escaping without effort or difficulty owing to the porosity of the sand, and the resulting castings all to be desired, unsightly scabs and gutters disappearing and much of the trouble will soon be a thing of the past.

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MR. BECK, senior director of the Pearson & Knowles Coal and Iron Company, Limited, has decided to retire.

MR. BRAMHILL has resigned his position at the works of John Yates & Company, Limited, of Birmingham, owing to ill-health.

SIR ANDREW NOBLE, BART., chairman of Sir W. G. Armstrong & Company, has celebrated his seventy-fourth birthday during the past month.

MR. S. J. ROBINSON, managing director of William Jessop & Sons, Limited, Sheffield, has had conferred upon him the honour of Knighthood of the First Class of the Royal Swedish Order of Wasa.

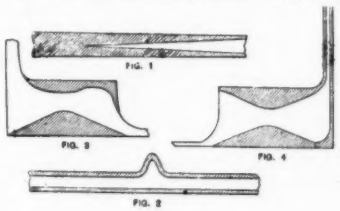
A PECULIAR CHILLED CASTING.*

By GEORGE C. DAVIS.

THE casting to which I am about to call your attention presents some unusual features. For this reason I wish to describe it, even though I have no theory as to its cause, nor am I able to give all the data. The accompanying illustrations, Figs. 1 to 4, all show parts of the same casting. As shown in Fig. 1, it varies in thickness from $\frac{1}{8}$ in. to $\frac{1}{2}$ in., and in places has a wedge-shaped chill surrounded by grey iron on each side. A part of the casting, even in the light section, is grey without trace of chill, though it is hard. The analyses are given in the following table:—

	A. Per cent.	B. Per cent.
Silicon	2.61	3.16
Sulphur	0.106	0.102
Phosphorus	0.60	0.74
Manganese	0.36	0.19
Graphitic carbon	3.40	0.25
Combined carbon		3.04

Owing to difficulty in sampling I am not able to present separate analyses of



the grey and white portions. The figures given under A represent the casting illustrated in Fig. 1. The drillings were taken as near as possible to the chilled part. Sample B was taken at the foundry and represents the white portion from several castings made at a later date than A.

Before proceeding with the discussion I will give the method of charging, so far as I can, as follows:—

Diameter of cupola	43 in.
Bed of cupola, broken coal	400 lbs.
Bed of cupola, coke	1,400 lbs.
Smelting charge, pig-iron	4,000 lbs.
Smelting charge, sprues	2,000 lbs.
Subsequent charges, coke	350 lbs.
Subsequent charges, pig-iron	1,600 lbs.
Subsequent charges, sprues	1,200 lbs.
Total melt, about	15 tons

The first discussion I have been able to find on internally chilled castings is in Vol 17, p. 700, of the "Transactions"

* Paper read before the Philadelphia Foundrymen's Association, October 2.

of the American Institute of Mechanical Engineers. An analysis is given, which is as follows :—

	White inside. Per cent.	Grey outside Per cent.
Silicon	2.74	2.85
Combined carbon	2.55	1.75
Graphitic carbon	1.31	1.87
Manganese	0.50	—

Phosphorus and sulphur are not given, but it is stated that no marked difference in these elements was found in the two samples. Internal chill is sometimes seen in pig-iron, and this was at first thought to be due to segregation of sulphur or manganese. So far as I know, this has never been proved, and the analyses I can recall show little difference between the grey and the white portions of the pig-iron, except in the ratio of graphitic to combined carbon.

To return to the casting under discussion, the silicon in A is correct for light work and should give good results; sample B is too high in this element, and I should expect a weak iron, but not a chill.

The sulphur in both cases is not excessive. In connection with this I would call your attention to the fact that while sulphur usually causes hard iron it does not always do so. I give in the table below two analyses of bad castings high in sulphur. These were water-backs for ranges. They leaked under the hydraulic test, and when broken showed a porous fracture with reddish spongy spots; as indicated in the analyses both were soft iron, yet they contain more sulphur and less silicon than A. Another water-back casting, first class in every respect, showed 0.096 per cent. sulphur, or nearly as much as sample A. I do not think there is any reason to attribute the chill to sulphur. Following are the analyses of the defective castings :—

	Per cent.	Per cent.
Silicon	2.49	2.53
Sulphur	0.153	0.142
Phosphorus	0.68	0 73
Manganese	0.52	0.46
Graphitic carbon	2 94	2.63
Combined carbon	0.21	0.59

Returning to the analyses given at the beginning of this paper, the phosphorus in both A and B is about as it should be; there is no reason to suppose it had anything to do with the chill.

The manganese evidently had nothing to do with the chill, as it is normal in A and low in B. The total carbon in A is correct for this class of work. In B it is a little low, as might be expected, owing to the high silicon, for in pig-iron, as a rule, silicon increases and carbon decreases.

It is believed by many that pig-iron made from magnetic ore has peculiar chilling properties. In this case samples A and B were made from these brands of pig-iron and sprues from previous heats. One brand is a Southern iron and the other two are local irons. Of the latter, one was made from an ore mixture containing about 9 per cent. magnetite and the other 35 per cent. of "local ores," which were probably mostly magnetite. The mixed pig-irons would only represent a small proportion made from magnetite, and I think we can safely dismiss this theory in this case.

Another theory held by many is that the cause is in the management of the cupola and pouring. I quote the views of a well-known furnaceman, who writes me as follows :—

"I have noticed that this peculiar condition—grey on the exterior and white on the interior—oftentimes in very thin pieces of casting, is due more to the melting of the iron than to the chemical composition of the iron. It cannot occur, however, with low silicon iron. So far as my experience goes, it is characteristic of the use of high silicon iron which has been melted in a cupola with a cold bottom, enabling the iron to take up sulphur, or the iron has been well melted and run into cold ladles, under which condition certain chemical changes take place, which have been remedied by melting the iron hotter, thus reducing the percentage of sulphur, and also in tapping the iron into hot ladles instead of moderately warm ladles."

Apparently, the analyses presented in the first part of this paper give us no clue as to the cause.

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THE following companies are in course of being wound up :—Bolton Iron and Steel Company, Limited, British Electrical Tool Company, Limited, Tangye Tool and Electric Company, Limited, Kingston Railway Wagon Company, Limited, the Darlington Wagon and Engineering Company, Limited, Abingdon Works Company, Limited, Standard Gas Engine Company, Limited, and the Grangemouth Iron Company, Limited. Ecco Works, Limited, the Cynon Colliery, Company, Limited, the Harboro' Hills Colliery Company, Limited.

CORRESPONDENCE.

CASTING MOTOR CYLINDERS.

To the Editor of the FOUNDRY TRADE JOURNAL.

SIR,—In reply to query by "B. M." who complains of leaky motor cylinders, this is a very difficult matter to decide without the aid of a sketch showing position of defect, also present method of running and rising.

The three greatest causes of this trouble are:—Blowing from the jacket cores, through inefficient heating; using iron too open in the grain; and running them in the wrong place.

If "B. M." would supply a sketch showing the methods mentioned above, no doubt it would be possible to settle the question definitely; otherwise it would be simply guess work.

Yours, etc.,

MOTOR.

—o—

TRADE TALK.

MESSRS. R. & J. C. SINCLAIR, engineers, Leith, have dissolved partnership.

MR. H. J. EMUSS, manufacturing engineer, of Ipswich, has been adjudged bankrupt.

MESSRS. D. J. NIVEN and H. H. KIRKBY, ironfounders, Sheffield, have dissolved partnership.

THE TANGYE TOOL AND ELECTRIC COMPANY, LIMITED, have been amalgamated with Tangyes, Limited.

JOHNSON & PHILLIPS, LIMITED, have lately started a department for the construction of motor vans.

MESSRS. W. OAKLEY, F. A. SIMPSON, and G. WOOD, engineers, of Leicester, have dissolved partnership.

MESSRS. A. HOLMES and E. HEATON, engineers, Honley, near Huddersfield, have dissolved partnership.

SIEMENS BROS. & COMPANY, LIMITED, have opened a branch office at Central House, New Street, Birmingham.

MESSRS. F. E. PLUMB and J. WIGHTMAN, engineers, of Newlay, near Leeds, have dissolved partnership.

JOHN BROWN & COMPANY, LIMITED, have removed their London business to 8, The Sanctuary, Westminster, S.W.

MR. A. H. HARRIS, general engineer, 113, etc., Caversham Road, Reading, has paid a dividend of 1s. 6½d. in the £.

MESSRS. E. W. SMITH and T. H. PRESTON, pattern-makers, Aston, near Birmingham, have dissolved partnership.

A RECEIVING order has been made in connection with the affairs of Mr. W. Martineau, engineer, of Wolverhampton.

THE boiler-making business of Messrs. M. & J. Layfield, Burnley, has been acquired by Messrs. W. W. Akins & Company.

MESSRS. FAIRBANKS, MORSE & COMPANY, engineers, have removed from 126, Southwark Street, London, to 87, Southwark Street.

THE UNITED STATES METALLIC PACKING COMPANY, LIMITED, have established a branch at Angel Chambers, York Street, Swansea.

A FIRST dividend of 6s. 8d. in the £ has been paid by Messrs. F. & R. Bradshaw, engineers, of the Griffin Works, Accrington.

THE PATENT AXLE BOX AND FOUNDRY COMPANY, LIMITED, of Wednesfield, contemplate erecting an additional foundry at their works.

MESSRS. W. N. BRUNTON & SON, wire-rope manufacturers, Musselburg, have established a branch at 144, St. Vincent Street, Glasgow.

A FIRE occurred during the month at the works of Messrs. Samuel Osborn & Sons, the Wicker, Sheffield, but not much damage was done.

THE business of Messrs. E. & W. H. Haley, Lister Hills Foundry, Bradford, Yorks, is to be sold, owing to the death of Mr. W. H. Haley.

A RECEIVING order has been made in connection with the affairs of Messrs. A. Fengl & Company, engineers, of Altrincham, Cheshire.

MR. F. J. BORLAND, of Messrs. Wharam & Borland, is resuming his old line of business at the Elmwood Engineering Works, Camp Road, Leeds.

MESSRS. MACCOLL & POLLOCK, Wreath Quay Engine Works, Sunderland, have just completed the erection of a large smiths' shop at their works.

MESSRS. DOBSON & BARLOW, engineers, of Kay Street Works, Bolton, have decided to erect works at Bradley Fold, some three miles out of Bolton.

MESSRS. W. WHARAM and F. J. BORLAND, mechanical engineers, Leeds, trading under the style of Wharam & Borland, have dissolved partnership.

MESSRS. C. HENDERSON & COMPANY, 73, Robertson Street, Glasgow, have been appointed sole agents in Scotland for Hayward-Tyler & Company, Limited.

AT the Halifax County Court recently permission was granted for the winding up of John Hitchen & Son, Limited, crane makers and ironfounders, Halifax.

MESSRS. SIMMONS & MATHEW, 58, Upper Thames Street, London, E.C., have been appointed London agents for Mr. T. Chatwin, of the Market Foundry, Tipton.

JOHN ELSWORTH & SONS, LIMITED, 39, Robertson Street, Glasgow, have acquired the engineering business of Messrs. Wassell & Murdock, of 25, Centre Street, Glasgow.

MESSRS. F. J. BRETHERTON and L. C. BRYAN, engineers, Grange Yard, Willesden Green, N.W., trading under the style of Bretherton & Bryan, have dissolved partnership

A FIRE broke out recently on the premises of Messrs. Smith & Coventry, engineers, Salford. The damage was confined to the pattern stores at the top of the building.

MESSRS. G. BIRD and J. E. BARTLE, ironfounders, Lancaster Road, Notting Hill, London, W., trading under the style of James Bartle & Company, have dissolved partnership.

THE PARKER FOUNDRY COMPANY, of Derby, after an experience of three years with the Whiting cupola, have just installed another of these cupolas in their new steel foundry,

THE LANCASHIRE DYNAMO AND MOTOR COMPANY, LIMITED, of Trafford Park, Manchester, have opened a branch at Star Buildings, Northumberland Street, Newcastle-on-Tyne.

AT a recent meeting of the Master Brassfounders' Association it was decided that a further 5 per cent. be added to net selling prices, and discounts be reduced by 2½ per cent.

HENRY BERRY & COMPANY, LIMITED, Croydon Works, Leeds, have appointed Messrs. R. E. Couch & Company, of Finsbury Pavement House, London, E.C., as their sole London agents.

MESSRS. JAMES BROWN & COMPANY, LIMITED, wire-rope manufacturers, of Preston, have appointed Mr. J. B. Parker, of Billiter Buildings, E.C., as their London representative.

MR. T. M. EASTHAM, 122, Trevelyn Buildings, Corporation Street, Manchester, has been appointed local agent for W. & J. Lawley, Britannia Foundry, Sams Lane, West Bromwich.

THE PARKER FOUNDRY COMPANY, of Derby, have secured 5½ acres of land in the town for the purpose of erecting new works. The company make a speciality of small castings for engineers.

CONSIDERABLE progress has been made with the new works of the Brotherhood-Croker Motors, Limited, at Tinsley, Sheffield, and it is expected that they will be opened by the end of October.

THE eighteenth anniversary of the establishment of the Cannon Iron Foundries, Limited, of Deepfields, occurred on September 8, when there was a dinner to celebrate the occasion.

BRETT'S STAMPING COMPANY, LIMITED, have lately installed large stamps at their works at Coventry, so as to enable them to produce the heavier drop forgings required in the engineering industry.

THE new works at Mosely Village of Messrs. W. Hayward & Sons, will give the firm better accommodation for carrying on their business. The old works at Wolverhampton will shortly be closed.

THE steel works at Mossend of the Summerlee and Mossend Iron and Steel Company, Limited, have been sold, and the title of the company has been altered to the Summerlee Iron Company, Limited.

W. & T. AVERY, LIMITED, Soho Foundry, Birmingham, are supplying the Imperial Japanese Navy with several of their special make of crane weighing machines, varying from 5 to 30 tons in capacity.

THE PEARSON AND KNOWLES COAL AND IRON COMPANY, LIMITED, made a record of production in the iron trade last year. The company turned out 110,000 tons of finished material, the previous largest record being 108,000 tons.

IN connection with the bankruptcy of Robert Russell & Sons, ironfounders, Carluke, and Robert and Charles Russell, individual partners, an equalising and final dividend from the funds of the company, and a first and final dividend from the estate of Charles Russell, will be paid on November 5.

THE HOLWELL IRON COMPANY, LIMITED, of Asfordby, near Melton Mowbray, are

supplying the cast-iron pipes and special castings for the Paignton Urban District Council new water scheme. The firm are also supplying pipes to the Liverpool Gas Light and Coke Company, and the Oldham Corporation Water Works.

THE PREMIER GAS ENGINE COMPANY, LIMITED, of Sandiacre, near Nottingham, are supplying Alfred Hickman, Limited, Bilston, with what is believed will be the largest gas-blowing engine in existence—certainly by far the largest in the United Kingdom, as it will have a capacity of 40,000 cubic feet of air per minute.

HENRY POOLEY & SON, LIMITED, of the Albion Foundry, Kidsglove, have just made what is considered to be the largest single weighbridge that has ever been designed. The weighbridge has been made on the Pooley self-containing system, and one remarkable feature of it is that, although the machine will weigh 160 tons, it is of very ordinary size, measuring only 14 ft. by 7 ft. Messrs. Cammell Laird & Company, for whom the weighbridge has been designed, intend placing it at the entrance of their works from the railway, and will use it for general traffic

MR. MAURICE GRAHAM has now recovered from a serious operation necessitated by an attack of appendicitis, and is again attending business. Messrs. Graham, Morton & Company have purchased from the liquidators of Graham, Morton, Limited, the whole of the drawings, designs, patent rights, etc., and also a very large quantity of the machinery, and have opened new works in Leeds for the manufacture of their specialities. It will be seen, therefore, that Mr. Graham practically retains the goodwill of the business. Besides his works in Leeds, he has opened offices at Carlton Chambers, Albion Street, Leeds.

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DEATHS.

MR. T. UNWIN, who for 30 years was on the official staff of Samuel Osborn & Company, Limited.

MR. T. LANCASTER, Secretary of the Carnforth Hematite Iron Company, Limited, aged 58.

MR. R. TIDMAN, of Bishop Bridge Road, Norwich, the founder of the Bishop Bridge Iron Works.

MR. GEORGE SINCLAIR, proprietor of the Albion Boiler Works, Bonnington, Leith, at the age of 71 years.

MR. F. R. HOLMES, engineer, of Norwich, a member of the late firm of Holmes & Sons, of Scole's Green.

MR. EDWARD GITTINGS, who was connected with the galvanised iron industry at Liverpool, aged 37 years.

MR. J. S. NAPIER, who founded the firm of Messrs. Napier & Macintyre, iron merchants, Glasgow, in his 77th year.

MR. R. WHITAKER, formerly a director of Howard & Bullough, Limited, of the Globe Engineering Works, Accrington, aged 78.

SIR RICHARD TANGYE, chairman of Tangye's Limited, at his residence, Coombe Bank, Kingston-on-Thames, at 73 years of age.

MR. J. POWELL, for some time London representative of J. E. Gibson & Company, Saltoun Iron Works, Falkirk, at the age of 76 years.

MR. W. LEE HARTCLIFFE, head of the firm of Hartcliffe & Malkin, engineers, brassfounders, etc., of St. Simon Street, Salford, Manchester.

MR. W. LITTLEWOOD, of Gainsborough, aged 77. Deceased had been head of the boiler-making department at the Britannia Works (Messrs. Marshall, Sons & Company, Limited), for 44 years.

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NEW COMPANIES.

WEDNESFIELD CONSTRUCTION COMPANY, LIMITED.—Capital, £100,000, in £1 shares.

NEWPORT BRASS FOUNDRY AND COPPERSMITHS' COMPANY, LIMITED.—Capital, £2,000, in £1 shares.

NORTHERN MANUFACTURING COMPANY, LIMITED.—Capital, £10,000, to carry on the business of ironfounders, etc.

W. TAYLOR, LIMITED.—Capital, £6,000, to acquire the engineering business carried on by D. Taylor, at Smethwick.

PATENT FILE AND TOOL COMPANY, LIMITED.—Capital, £40,000, in £1 shares. Registered office: 8, White Street, Moorfields.

JOHN BRIGGS (GOMERSAL), LIMITED.—Capital, £1,000, to acquire the engineering business carried on by Mr. E. Briggs, at Gomersal.

J. & J. Mallinson, Limited.—Capital, £3,000, to acquire the business of Mr. J. Mallinson, Stanley Iron Works, New Bank, Halifax.

New Croker-Barnes Company, Limited.—Capital, £2,000, in £1 shares, to take over the business of the Croker-Barnes Tool Syndicate, Limited.

Owen Robinson & Company, Limited.—Capital, £15,000, to acquire the business of ironfounders carried on at Kettering as O. Robinson & Company.

Castle, Desmond & Company, Limited.—Capital, £4,000, to carry on the business of engineers, etc. Registered office: Bank Chambers, 2-3, High Street, Oxford.

Franklin & Isaacson, Limited.—Capital, £5,000, to acquire the business of engineers carried on at 18, Great Wilson Street, Leeds, as Franklin & Isaacson.

W. Taylor, Limited.—Capital, £6,000, to acquire the engineering business carried on by D. Taylor, at Smethwick. Registered office: Stour Valley Foundry, Smethwick.

W. A. Wilson & Company, Limited.—Capital, £1,000, to acquire the ironfounding business carried on at Ivor Street, Kirkdale, Liverpool, as W. A. Wilson & Company.

The Globe Gas Engine Company, Limited.—Capital, £30,000, in £1 shares, to acquire the business of Pollock, Whyte & Waddell, Globe Gas Engine Works, Johnstone. Registered office: Beith Road, Johnstone, N.B.

Woolley & Company, Limited.—Capital, £2,000, to acquire the engineering business carried on at 6, Legge Lane, Birmingham, as Woolley & Company, and at 66, Highgate Road, Camp Hill, Birmingham, as Alling & Company. Registered office: 6, Legge Lane, Birmingham.

Anderson & Duffield, Limited.—Capital, £25,000, in £1 shares, to amalgamate the businesses of D. Anderson & Company, Limited, 73, Farringdon Road, E.C., and Mark Duffield & Sons, Limited, Slough, and to carry on the business of ironfounders, etc. Registered office: 73, Farringdon Road, E.C.

Ganister, Cupola Blocks, Fire Bricks,

Fire Clay.

Silica Bricks, Tuyeres, Stoppers, Nozzles, &c.

Steel Moulders' Composition, Silica Cement.

J. GRAYSON LOWOOD & Co., Ltd.,

DEEPCAR, nr. SHEFFIELD.

Telegrams: "LOWOOD, DEEPCAR."

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Telegrams: "Zacatecas, London." Telephone 2546 Gerrard

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TO THE PUBLISHERS, **"The Foundry Trade Journal,"**

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PLEASE enter me as a Subscriber to "THE FOUNDRY TRADE JOURNAL" until this order is countermanded, for which is enclosed 7s. 6d. in payment of One Year's Subscription.

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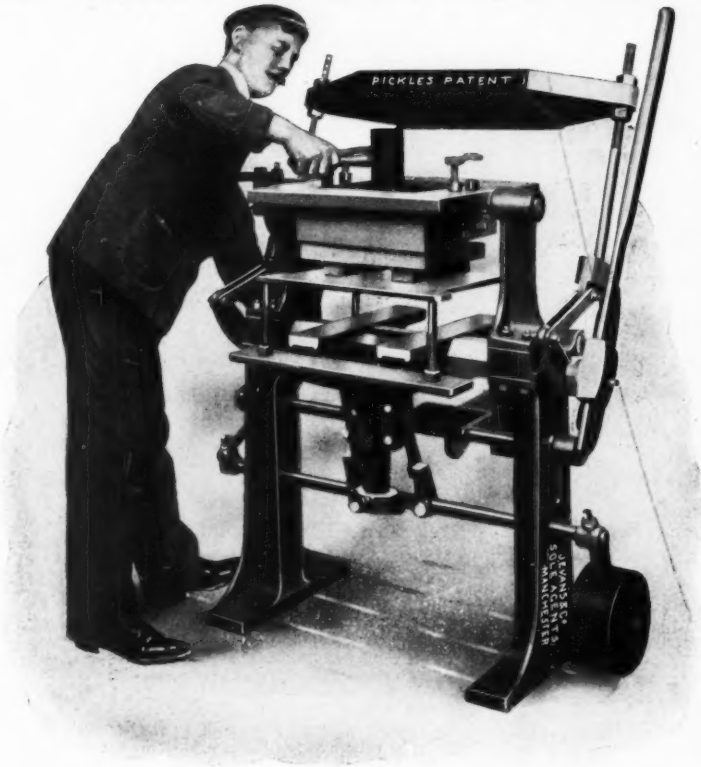
NEW MOULDING MACHINE.

PICKLES' PATENT.

ASK FOR LIST AND FULL PARTICULARS.

COMPLETE FOUNDRY EQUIPMENT.



JAMES EVANS & CO.,

Britannia Works, MANCHESTER.

TELEGRAMS: "LADLES, MANCH STER." "BLACKINGS, GLASGOW." TELEPHONE: 2297, MANCHESTER. 3.85, BRIDGETON, GLASGOW.

PERSONAL.

MR. J. M. LAIRD, chairman of Cammell Laird & Company, Limited, is in Canada.

SIR WILLIAM STEPHENSON, who has been very seriously ill, is now progressing favourably.

MR. E. JONES, chief engineer to Kynoch, Limited, has been elected to a seat on the board.

MR. L. D. WHITEHEAD, one of the proprietors of the Deighton Works, Tredegar, is in the United States.

MR. W. ANDERSON, of Head, Wrightson & Company, Limited, will be the Mayor of Thornaby during the ensuing year.

MR. T. E. HASLAM, assistant secretary, has been appointed secretary of the Sheepbridge Coal and Iron Company, Limited.

MR. H. S. BLECKLEY has been elected a director of the Pearson & Knowles Coal and Iron Company, Limited, in place of Mr. E. Beck, retired.

MR. W. H. ROBINSON, engineer at the Frodingham Iron and Steel Works, has accepted a position with Messrs. S. Fox & Company, of Sheffield.

MR. W. F. OSBORN, of the firm of S. Osborn & Sons, Clyde Steel Works, Sheffield, has been installed the 283rd Master of the Cutlers' Company.

SIR J. EDWARD JOHNSON-FERGUSON, Bart., a director of Bolckow, Vaughan & Company, Limited, has resigned his seat at the board of Williams Deacon's Bank.

MR. S. B. EVANS, manager of the Earl of Dudley's Round Oak Iron and Steel Works, Brierley Hill, Staffordshire, has been appointed manager of the Port Talbot Steel Works.

MR. T. ELLIS, a director of Finch's Iron Works, Chepstow; Mr. J. Rowe, manager of Finch's Iron Works; and Mr. A. I. R. Butler, manager of the Panteg Steel Works, Pontypool, have been made J.P.'s for the county of Monmouthshire.

MR. A. FEATHERSTONE, managing director of C. & W. Walker, Limited, Midland Iron Works, Donnington, near Newport, Salop, has been the recipient of a presentation from the officials and men on the occasion of his retirement.

ELDERS FOUNDRY COKE

As supplied to the British . . Admiralty Dockyards.

The following, selected from numerous letters, are eminent testimony as to the quality of our celebrated "A.A.A." Coppee Foundry Coke, carefully selected, and despatched in sheeted wagons.

From PECKETT & SONS, Bristol.

Bristol, October 25th, 1904.

We have been using your Selected Foundry Coke for some considerable time.

We have pleasure in stating that we are very pleased with it, as we find we get sounder and cleaner castings, more free from blow-holes and other defects, than we formerly did.

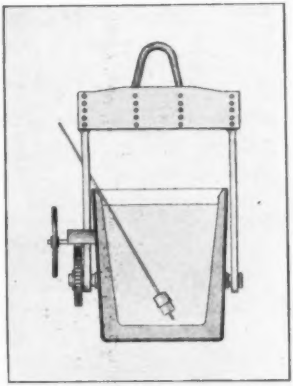
From MOUNTFORT PHILLIPS & Co., Llantrissant.

Llantrissant, October 25th, 1904.

In reference to the Foundry Coke you have been supplying us with for the last six months, we have very great pleasure in letting you know that it has given every satisfaction, and that our Works Manager and Workmen give it the highest praise.

Elders Navigation Collieries, LTD. Cardiff.

PREVENTION OF BLOWHOLES IN CAST IRON.



A tin of our special compound fixed on a rod is held at bottom of ladle as shown; a strong re-action being thereby set up frees the iron from gases and impurities, which rise to the top.

RESULT: A denser casting of finer grain with increased strength.

For Particulars apply to—

THERMIT LIMITED,

27, MARTIN'S LANE, CANNON STREET,

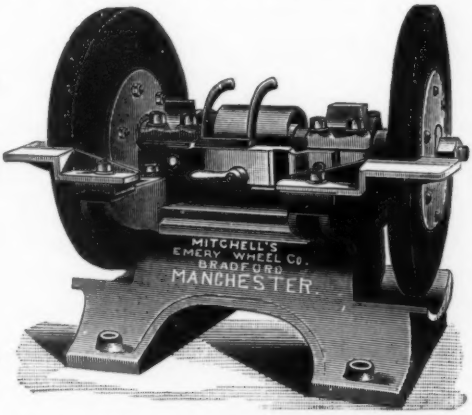
Telephone—3749 Central.
Telegrams—"Fulmen," London.

LONDON, E.C.

MACHINES For all Purposes. **WHEELS.**

Complete with Emery or Corundum Wheels from **£2** upwards.

Special Machines Designed.



Emery or Corundum from 1 in. x $\frac{1}{8}$ in. to 50 in. x 12 in.

Enquiries solicited.

MITCHELL'S EMERY WHEEL Co.,

Mill Street, Bradford, MANCHESTER.

Also at LONDON, GLASGOW, and BELFAST.

LISTS FREE.

PRICES OF METALS.

The following table shows the approximate latest prices and position of stocks of metals during the past two years :—

Metals.	1905-6.	1904-5.
Iron—Scotch pig warrants ... ton	62/0	—
—Middlesbro' warrants ... ton	57/9½	52/3
—W.C. M/nos Bessemer ... ... ton	70/0	71/9
—Stock, Scotch, Nov. 2 ...tons	10,030	16,377
Copper—Chili bars, GMB ... ... ton	£97 2/6	£71 12/6
—Stock, Europe & afloat... ... tons	—	15,772
Tin—English ingots ton	£193 0/0	£152 0/0
—Straits ... ton	£192 15/0	£149 10/0
—Stock, Ldn. Hind and aft ... tons	—	12,495
Lead—English pig ton	£19 15/0	£15 7/6
Spelter—Ord. Silesian ... ... ton	£27 15/0	£23 0/0
Quicksilver—(75lb.) bottle	£7 0/0	£7 5/0
Antimony—Regulus ... ... ton	£107 10/0	—

*Settlement price.

Castings.

In the Cleveland district the following are the nominal rates current for castings :—

	£ s. d.		£ s. d.
Columns (plain)	6 15 0	to	7 5 0
Pipes, 1½ to 2½ in.	5 2 6	to	5 7 6
,, 3 to 4 in.	4 15 0	to	4 17 6
,, 5 to 8 in.	4 12 6	to	4 15 0
,, 10 to 16 in.	4 12 6	to	4 15 0
,, 18 to 24 in.	4 12 6	to	4 15 0
Chairs	3 15 0	to	3 17 6
Floor plates (open sand)	3 8 6	to	3 12 6

Scrap.

The quotations for scrap, subject to market fluctuations, are as follows: —Heavy wrought (mixed), £2 13s. 6d.; light wrought, £1 6s.; heavy cast, £2 7s.; all per ton f.o.b., London. Copper (clean), £89; brass (clean), £60 10s; lead (usual draft), £17 10s; tea lead, £15 15s.; zinc, £22 15s.; all per ton delivered merchant's yard.

SILICA FIRE BRICK Co.,

OUGHTIBRIDGE.

GROUND GANISTER,

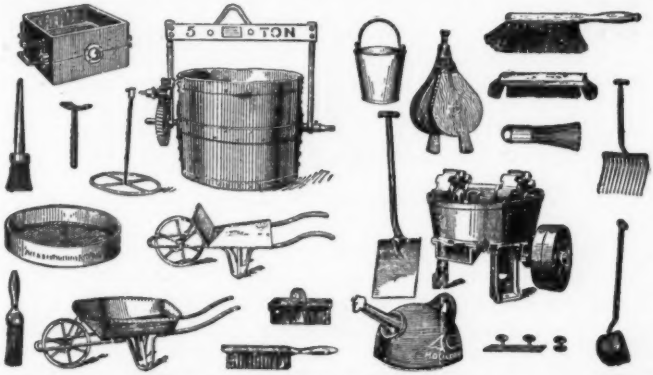
Wet or Dry.

Silco Cupola Bricks, 90 % Silica.

Better than Fire-clay Bricks for Cupolas.

Established 1863.

Jas. Durrans & Sons,



PHŒNIX WORKS, PENISTONE, Near Sheffield.

Manufacturers of all

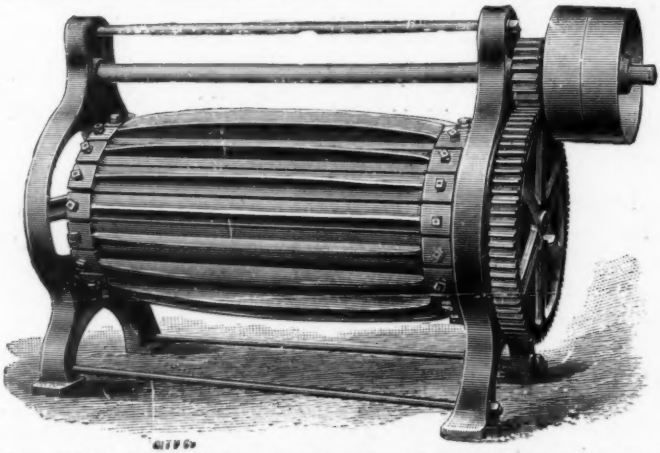
FOUNDRY EQUIPMENTS,

Composition Black Lead,

Plumbago, Core Gum, White Dust, and Coal Dust.

Ladles, Cupolas, Fire Bricks, Gannister, Stone Flux, Loam and Sand Mills, Casting Cleaners, Studs, Chaplets, Pipe Nails, Sprigs, Brushes, Wire Brushes, Core Ropes, Bellows, Buckets, Spades, Forks, Riddles, Sieves, Barrows, &c.

IMPROVED FOUNDRY RATTLER or FETTLING DRUM.



These Machines are invaluable for a Foundry, doing a larger amount of work of a superior quality, in a much shorter time than can be done by hand, without skilled labour.

"Dear Sirs,—We have been using your best Blacking for a large number of years, and always use it on our large Ingot Moulds, which, as you know, we have made up to 85 tons in weight.

"Yours faithfully, THE BRIGHTSIDE FOUNDRY & ENGINEERING CO., LD."

The most successful Foundry Specialities are

THE PIFTIN SPECIALITIES.

The Piftin Specialities are in universal favour with Founders both large and small, and are in constant use throughout the World.

The reason of their great and continued success is that each Speciality handled by us is proved to be a practical success *before* it is placed on the market.

It costs us a lot of money, time, and trouble to ensure this, but then it enables us to fully satisfy our buyers, and we thereby gain what we aim at—The repeat orders of our numerous clientele, both at Home and Abroad.

If, therefore, you are wanting anything for your Foundry, you should get the best of its kind, which is the *PIFTIN.*

The Piftin High Pressure Blower

Over 80 have been supplied to H M. Government.

The Piftin Portable Mould Drier

In use throughout the World, including the principal British and Continental Foundries.

The Piftin Sand Renovating System

Saves 80% of the yearly sand Bill.

The Piftin Sand Mixing Machine

The most efficient machine on market.

The Piftin Sand Blast Machinery

Adapted for all purposes.

Up-to-date in every respect. The most efficient, most simple, and most easily worked of any apparatus on the market. Saves the entire cost in the first few months.

For further particulars apply to

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PLEASE NOTE NEW ADDRESS. LONDON, E.C.

SITUATIONS VACANT & WANTED.

PATTERN Maker, young, clever, Wanted. Give particulars and wages to Box 604, Offices of THE FOUNDRY TRADE JOURNAL, 165, Strand, London, W.C.

WANTED, MANAGER (Commercial and Mechanical) for Steel Sheet Mill in the North of England; capacity 110 tons weekly.—Apply to Box 606, Offices of THE FOUNDRY TRADE JOURNAL, 165, Strand, London, W.C.

FOR SALE AND WANTED.

FOR SALE, "Root's" Patent Foundry Blowers, &c.

No. 2 size by	"Thwaites"	8 in. outlet	£22.
No. 1 ,,	"Allday's"	7 in. ,,	£20.
No. 1A ,,	,,	6 in. ,,	£20.
No. 3 ,,	"Wilkinson"	6 in. ,,	£17.

Two 7 ft. by 4 ft. Vertical Boilers, as new, each... ... ... £34.

For full details address J. LIGHT, Wolverhampton.

TO BRASS FOUNDERS & ENGINEERS.—Complete Analysis of any Alloy, 25s.—L. PARRY, A.R.S.M., Union Bank, York, Huddersfield. Speciality—Brasses, Bronzes, Anti-Friction Metals. 12 years' experience.

EVERY IRONFOUNDRY should use Hall's Improved Centrifugal Sand Grinder and Mixer, which utilise the waste sand from the Foundry, and makes it in the best possible condition for Moulding High Class Castings. Capacity 4 tons per hour. Price and Particulars, apply to J. S. HALL & CO., LTD., Midland Ironworks, Newark on-Trent.

CUPOLA LININGS.

HIGH-CLASS QUALITY

FIRE BRICKS

Made from specially selected clays.

BEST CRUCIBLE CLAYS.

Blast Furnace, Hot Air Stove, Boiler Seating, Flue Cover, and other Best Fire Bricks.

JOHN HALL & CO,

OF STOURBRIDGE, LTD.,

STOURBRIDGE.

STIGNIC PAINT.

NEWEST AND BEST WASH FOR STEEL FOUNDERS

PLASTIC CUPOLA GANISTER.

FINEST MATERIAL FOR LINING CUPOLAS AND FURNACES AND SETTING FIRE-CLAY BRICKS.

SPECIAL **STEEL MOULDERS' COMPO.**

STEPHENS & CO., Kidwelly.

FOUNDRY EQUIPMENT.

PATENT CORE MAKING MACHINES

No linseed oil or flour required.

NEW PORTABLE MOULD DRIERS

Moulds dried on the spot in an hour to one hour and a half.

J. W. & C. J. **PHILLIPS,**

23, COLLEGE HILL, London, E.C.,

And 7, PARK SQUARE, LEEDS.

COLD BLAST PIG-IRON.

M. & W. GRAZEBROOK,

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JAMES DOUGALL & SONS, LTD.,

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Foundry Specialists.

GANISTER, FIREBRICKS,

GANISTER BRICKS, FIRECLAY,

Of the Highest Qualities.

If you are troubled with Defective Fire-Resisting Materials write for Prices.

SHIPPING PORTS:

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Reproduction of a photograph showing some of the cores that have been made on our Patent Core Making Machine.

IF YOU HAVE REPETITION CORE WORK, WRITE US FOR PARTICULARS.

Special Core Machines for Parallel Cores.
Core Ovens, Etc., Etc.

THE LONDON EMERY WORKS CO., DEPT. "C.,"
PARK, TOTTENHAM, LONDON, N.

AIR COMPRESSORS.

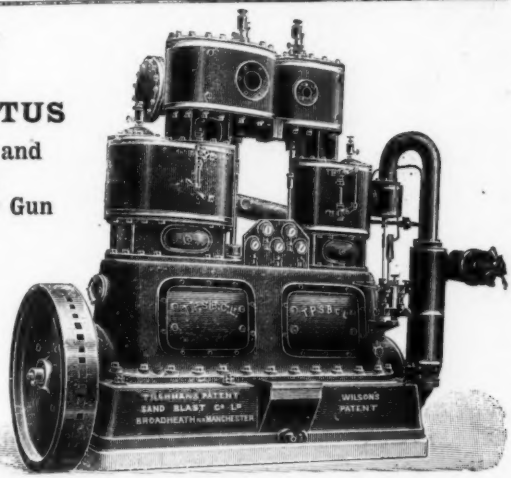
Other Specialities:

SAND BLAST APPARATUS

for cleaning large and small Castings, either Steel, Iron or Gun Metal.

PORTABLE MOULD DRIERS.

Catalogues on application.



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BROADHEATH, near MANCHESTER.

A REVOLUTION IN

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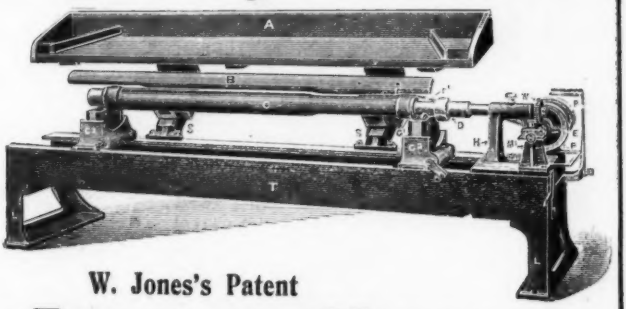

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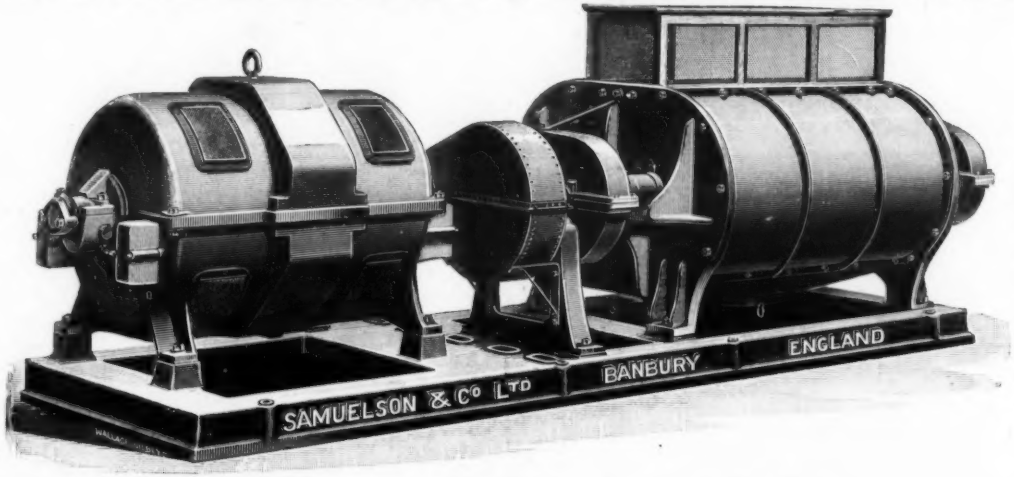

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